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WAR MACHINE

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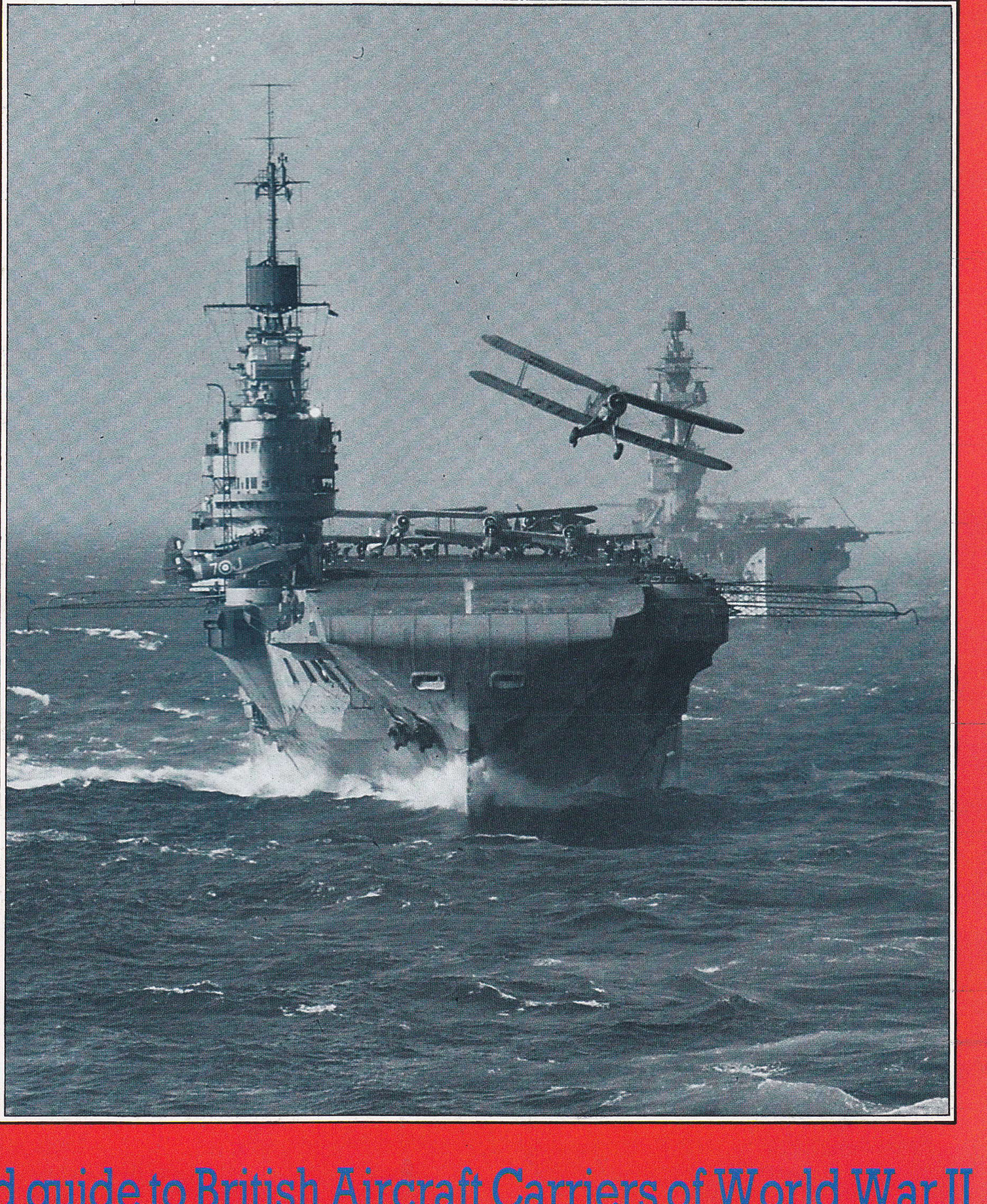

A fully illustrated guide to British Aircraft Carriers of World War II

WAR MACHINE

Volume 5 Issue 57

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Armed Forces of the World

US Marine Corps (Part 1) iii

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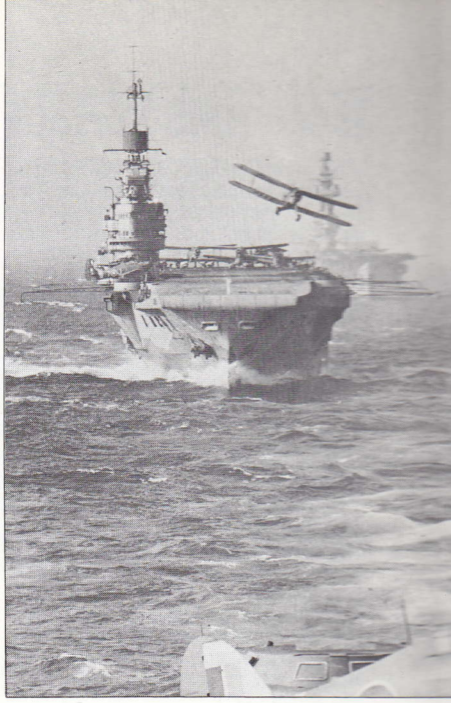
British Aircraft Carriers of World War 11

With a limited number of ships but with worldwide responsibilities, the Royal Navy deployed and operated its carriers in a very different way to the Americans. Yet despite their lack of numbers and mediocre aircraft, British carriers made a vital contribution to the victory at sea.

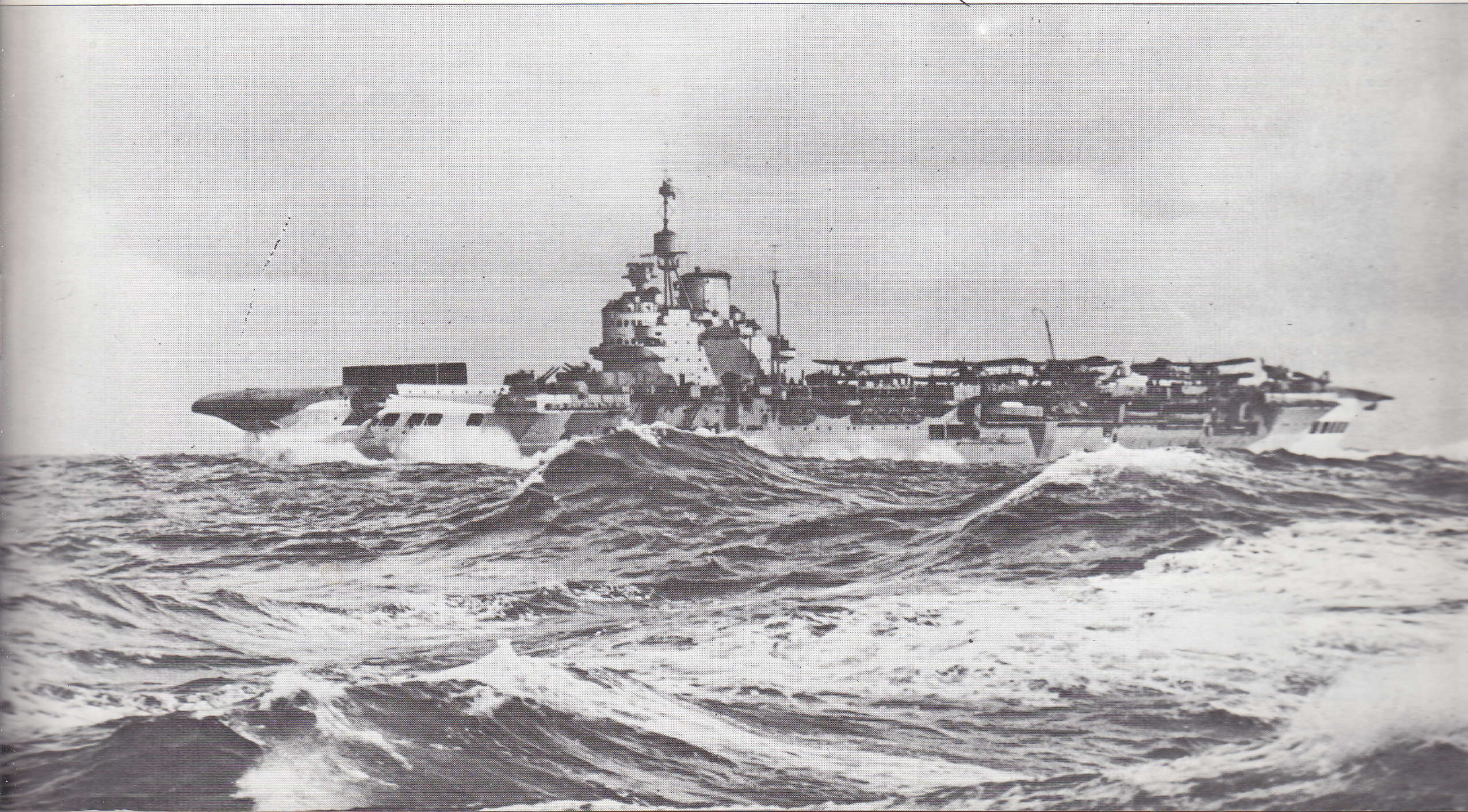


The toughest campaign for British carriers was the siege of Malta; they were exposed to the full fury of the Luftwaffe. An even greater menace lurked below the waves: Ark Royal *and* Eagle *were both lost to U-boat attack.*

Though the British pioneered aviation at sea and at the end of World War I were well ahead of everybody in the field, they lost their way badly between the wars, squandering their great initial advantage. Probably the most contentious issue of the time was RAF control of the Fleet Air Arm for the two decades from 1918, with interservice problems doing nothing for the spirit of the service. Second was the deteriorating performance standard of FAA aircraft in comparison with foreign equivalents: this problem was as much naval as RAF in origin but meant that, initially at least, the Royal Navy's aircraft were almost invariably outclassed in combat. Lastly, there were the ships themselves. The UK's naval appropriations between the wars resulted in the first of the third-generation carriers coming forward too late for working experience to be gained before the emergency programmes began. Therefore the Royal Navy entered the war with too few flightdecks, while those that were coming forward were, it could be argued, over-protected. With massive vertical armouring, their aircraft capacity was drastically reduced and construction times lengthened. Late in the war, it was quite convincingly shown that the later fleet carriers, with the same horizontal but much reduced vertical protection, survived *kamikaze* strikes as well as their heavier sisters, while enjoying the benefits of an enhanced aircraft capacity.

The Royal Navy fought a different type of war to the Americans and Japanese. In place of the latters' vast trials of strength in a comparatively limited theatre were world-wide responsibilities in the defence of trade and vital outposts, together with long and patient operations against unwillingly-disturbed fleets-in-being that could not be ignored. These functions, together with the value placed on each carrier, engendered a fundamentally defensive approach. Only with the formation of the British Pacific Fleet could the Royal Navy permit itself the luxury of hazarding major units by going on the offensive. For the first time, four and five fleet carriers worked together, the irony being that they were fighting a war already won by a US fleet that overshadowed their efforts in every way. Yet, a similar force working in European waters, even only a couple of years previously, would have rewritten maritime history.

HMS Victorious *fought in every major theatre of operations during World War II. Surviving two* kamikaze *suicide bomb attacks, she was eventually reconstructed and served until 1967.*



UK

HMS *Furious*

The several guises of HMS ***Furious*** represented the transitional stages between what might be termed 'air-capable' ships and the true aircraft-carrier. As the third of Admiral Fisher's 'tin-clad' light battle-cruisers (laid down in 1915), she was launched in August 1916 but delayed in completion to allow her to ship the navy's largest gun, a 457-mm (18-in) weapon, in single mounts at each end. Although virtually complete in March 1917, she then had her forward gun removed in favour of a sloping flying-off deck some 69.5 m (228 ft) in length. A hangar beneath this deck accommodated up to 10 aircraft (some seaplanes and some wheeled). Completed thus in July 1917 she rapidly showed the limitations of carrying aircraft that could not (officially at least) be recovered after a flight. In November 1917, therefore, her after gun mounting made way for a 86.6-m (284-ft) flying-on deck over a second hangar. Much of her superstructure still remained, however, and the high speeds at which she steamed to create the necessary wind-over-deck resulted in severe turbulence, causing an unacceptable accident rate among would-be landers-on. Relegated again to flying-off only, the *Furious* still had the distinction of mounting the first real carrier-based air strike when, on 19 July 1918, seven of her Sopwith Camels destroyed two Zeppelins and their sheds at Tondern. A through-deck was obviously required, as on the new *Argus*, and she was thus modified between 1921 and 1925. Even following this, she was still of interim design, having no island. Not until her final prewar refit did she acquire a vestigial superstructure, topped-off by a diminutive mast that supported a distinctive homing beacon.

Despite her age and infirmities, the *Furious* saw service in Atlantic hunting groups and convoy escorts, the Norwegian campaign, aircraft-ferrying to both Malta and West Africa, and the North African landings. Her last flying was against the *Tirpitz*, immured in a Norwegian fjord, before she went into reserve during September 1944. She was scrapped in 1948.

Specification

HMS *Furious*

Type: fleet aircraft-carrier

Displacement: 22,500 tons standard and 28,500 tons full load

Dimensions: length 239.5 m (785.75 ft); beam 27.4 m (90 ft); draught 7.3 m (24 ft)

Propulsion: 4-shaft geared steam turbines delivering 90,000 shp (67113 kW)

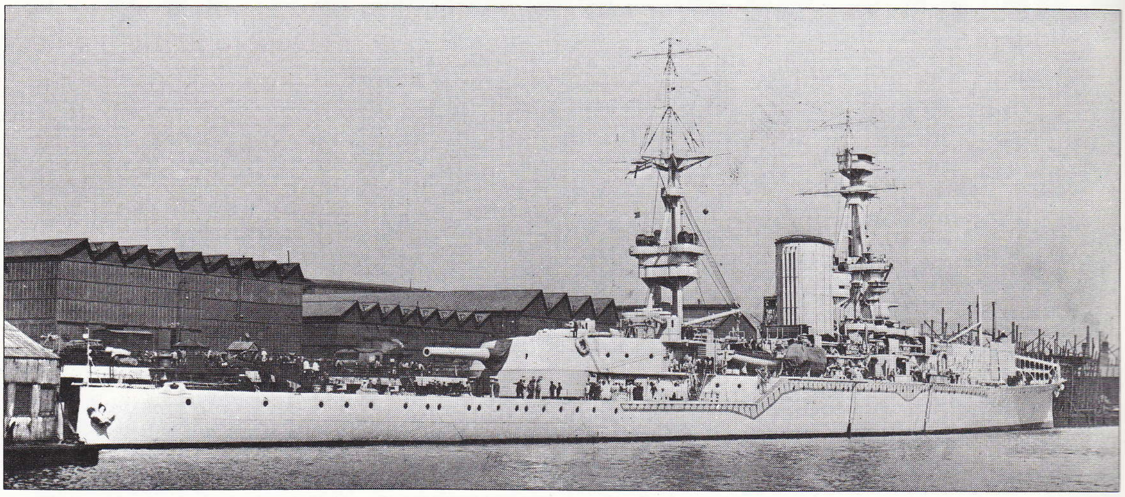
Speed: 31.5 kts

Armour: belt 51-76 mm (2-3-in); hangar deck 38 mm (1.5 in)

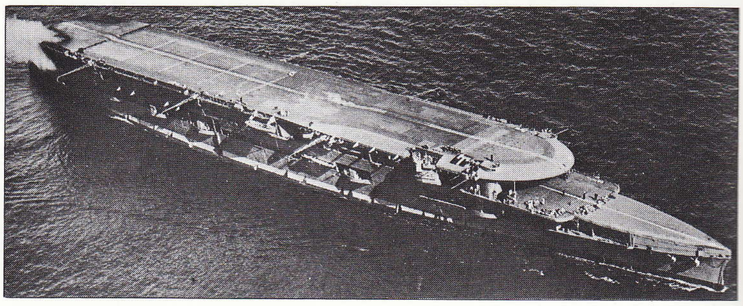
Armament: six twin 102-mm (4-in) AA, three octuple 2-pdr AA, and several smaller-calibre guns

Aircraft: 33

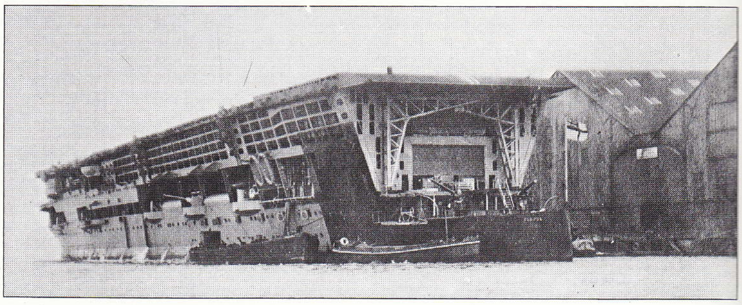
Complement: 750 excluding aircrew



Above: Landing on HMS* Furious*'s forward deck was very dangerous; Squadron Commander Dunning was killed when his Sopwith Pup overshot. In November 1917 the after 18-in gun was removed in favour of a flying-on deck.

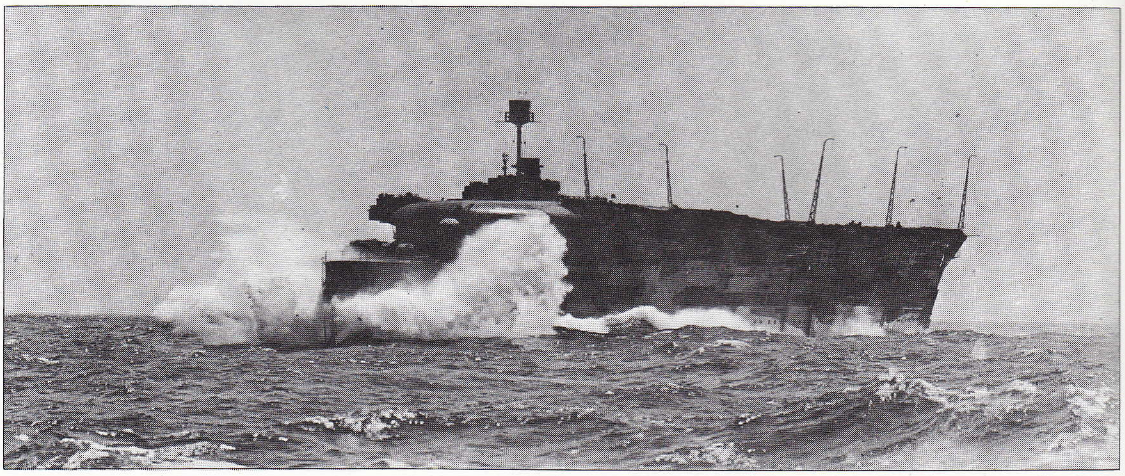


Right: The first ship to launch an air strike, HMS* Furious *was originally designed for Admiral Fisher's plan to attack Germany's Baltic coast during World War I.

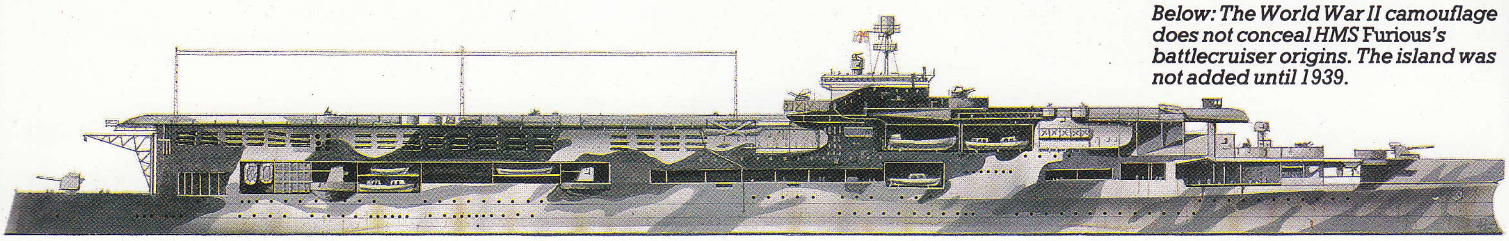


Right: HMS* Furious *in April 1927. The superstructure was removed in 1921 as it created serious turbulence problems. Further alterations took place in the 1930s, cross-deck arrester gear was fitted and the AA gun arrangement changed.

Below: In her World War II guise HMS* Furious *looked radically different from the ship that attacked the Zeppelin sheds in 1918. By the time she took part in Operation 'Torch', the Allied landings in North Africa, she carried 33 aircraft.



Below: The World War II camouflage does not conceal HMS* Furious*'s battlecruiser origins. The island was not added until 1939.



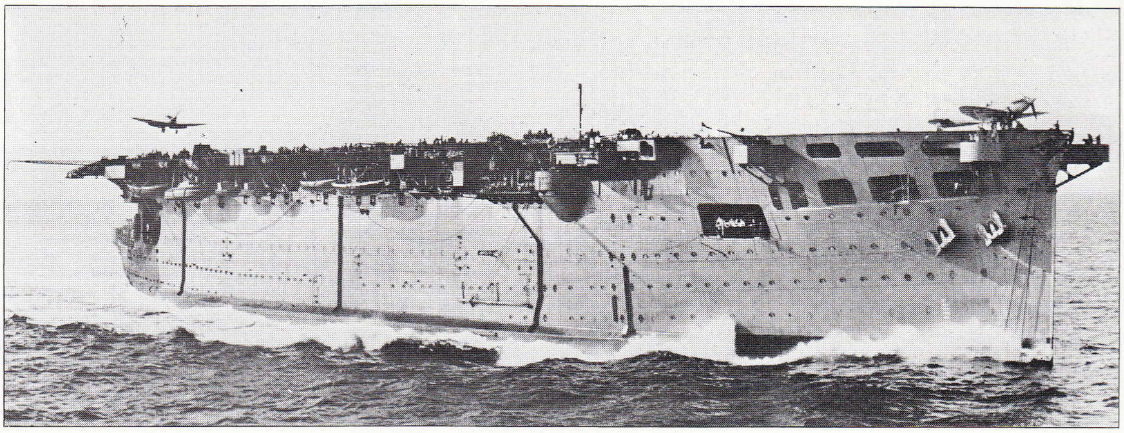
UK

HMS *Argus*

Proposals had been made before World War I for an aircraft-carrier with a straight-through flightdeck capable of handling the launch and recovery of wheeled aircraft, but the Royal Navy had to 'make do' with improvised seaplane carriers, and it was not until 1916 that the proposer, the Beardmore commercial yard, was given the contract to complete a half-finished Italian liner as a prototype carrier. The ship, the *Conte Rosso*, had been laid down in 1914 and had suitable dimensions plus the high freeboard necessary for the job. No superstructure was planned to interrupt the flightdeck which, like those of all pioneering carriers, was pointed at the forward end. A single hangar was provided and the necessary small charthouse was made retractable into the flightdeck. As full of character as she was devoid of grace, HMS **Argus** was understandably known as 'The Flatiron'.

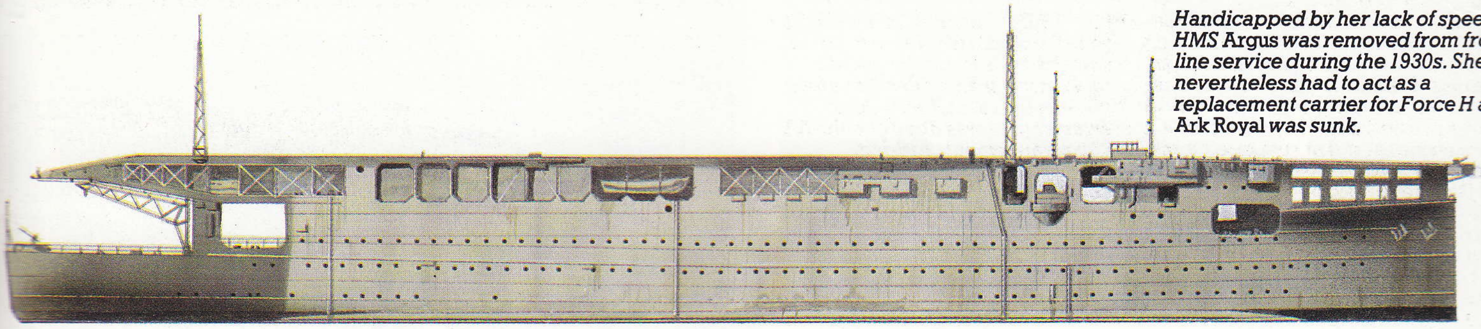
Her name (Argus was all-vigilant, with 100 eyes) suggests that she was seen by planners as being strongly reconnaissance-orientated, particularly with the recent memory of Jutland, a victory lost for want of good intelligence. She was wanted for the end of 1917 but was launched only in December of that year, and eventually commissioned only weeks before the Armistice of November 1918, carrying a squadron of the unpopular Sopwith Cuckoo torpedo aircraft.

In the late 1920s the *Argus* was bulged to improve stability as much as to enhance survivability and, after the completion of the larger fleet carriers, acted as a training and target aircraft-carrier. Small and slow by World War II standards, she gave valuable service ferrying fighter aircraft to Gibraltar, Malta and Takoradi (for onward staged flights to Egypt). Lack of carriers saw her also in operational roles from time to time, notably on an Arctic convoy and at the North African landings. From mid-1943 she was used only for training in home waters, being paid off in 1944. She was scrapped in 1947.



HMS** Argus **off the North African coast, November 1942. The Royal Navy's first flush-decked carrier started life as an Italian liner. She was extensively used as a trials ship in the years after World War I, proving the validity of the straight-through flightdeck design.

Specification
HMS *Argus*
Type: training, aircraft-ferry and second-line aircraft-carrier
Displacement: 14,000 tons standard and 15,750 tons full load
Dimensions: length 172.2 m (565 ft); beam 20.7 m (68 ft); draught 7.3 m (24 ft)
Propulsion: 4-shaft geared steam turbines delivering 21,000 shp (15660 kW)
Speed: 20.5 kts
Armour: none
Armament: six 102-mm (4-in) AA, and several smaller-calibre guns
Aircraft: about 20
Complement: 370 excluding aircrew



Handicapped by her lack of speed, HMS Argus was removed from front-line service during the 1930s. She nevertheless had to act as a replacement carrier for Force H after Ark Royal was sunk.

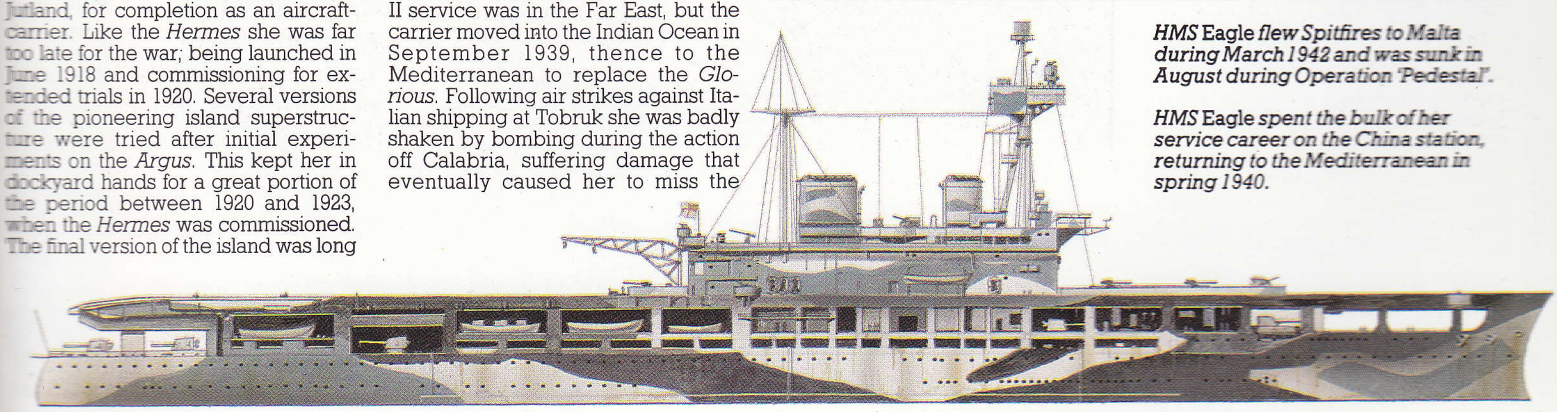
UK

HMS *Eagle*

Before World War I, Chile ordered two stretched 'Iron Duke' class battleships from Armstrong's Elswick yard. Only one of these, the *Almirante Latorre*, was well advanced by August 1914; compulsorily purchased by the Admiralty, she was completed in 1915 as HMS *Canada*. Work on her unlaunched sister, the *Almirante Cochrane* (laid down in 1913), ceased with hostilities but she was taken in hand, post-Jutland, for completion as an aircraft-carrier. Like the *Hermes* she was far too late for the war; being launched in June 1918 and commissioning for extended trials in 1920. Several versions of the pioneering island superstructure were tried after initial experiments on the *Argus*. This kept her in dockyard hands for a great portion of the period between 1920 and 1923, when the *Hermes* was commissioned. The final version of the island was long and low, topped-off by two funnel casings with the same thick and thin proportions as the ship's erstwhile sister. Her more ample battleship proportions made her considerably slower than the large cruiser conversions, but she had better stability. Despite the fact that she introduced the two-level hangar, she still had only modest aircraft capacity.

Much of the *Eagle*'s pre-World War II service was in the Far East, but the carrier moved into the Indian Ocean in September 1939, thence to the Mediterranean to replace the *Glorious*. Following air strikes against Italian shipping at Tobruk she was badly shaken by bombing during the action off Calabria, suffering damage that eventually caused her to miss the

HMS ***Eagle*** *flew Spitfires to Malta during March 1942 and was sunk in August during Operation 'Pedestal'.*

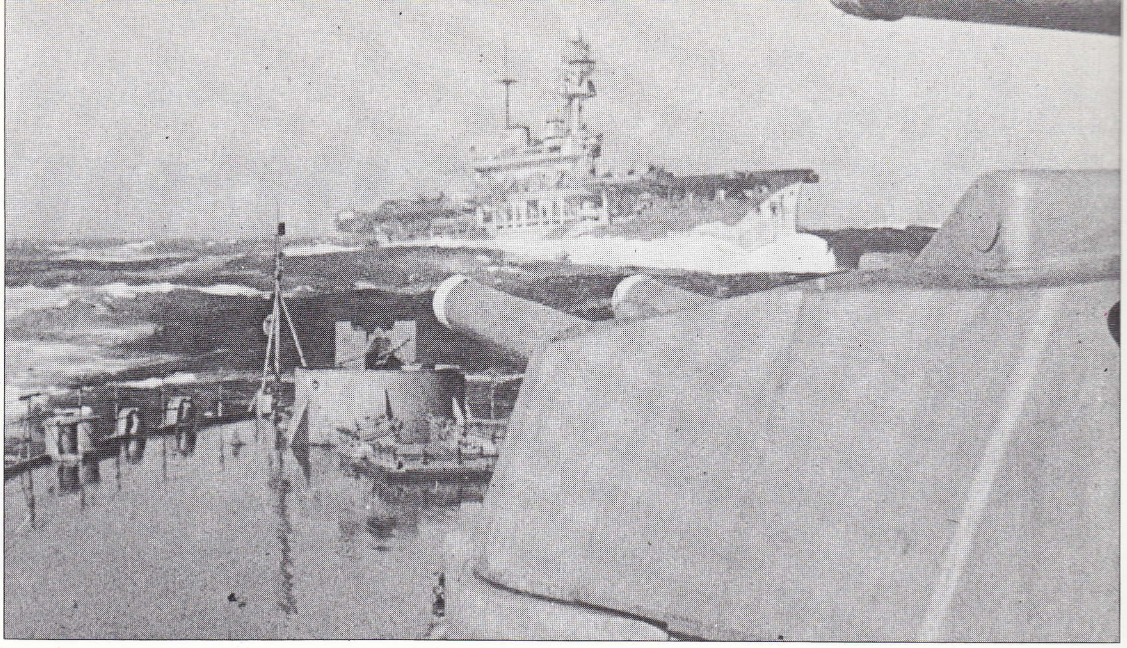


HMS ***Eagle*** *spent the bulk of her service career on the China station, returning to the Mediterranean in spring 1940.*

Taranto raid. Before she could refit in the UK, she saw further action in the Red Sea and the South Atlantic. Arriving back in the Mediterranean early in 1942, she was later involved in the famous August convoy (Operation 'Pedestal') when 41 warships fought through just five out of 14 merchantmen to lift the Malta siege. The *Eagle* was a major casualty, sunk by four torpedoes from *U-73* on 11 August 1942.

Specification

HMS *Eagle*
Type: fleet aircraft-carrier
Displacement: 22,600 tons standard and 26,500 tons full load
Dimensions: length 203.3 m (667 ft); beam 32.1 m (105.25 ft); draught 7.3 m (24 ft)
Propulsion: 4-shaft geared steam turbines delivering 50,000 shp (37285 kW)
Speed: 24 kts
Armour: belt 102-178 mm (4-7 in); flightdeck 25 mm (1 in); hangar deck 102 mm (4 in), shields 25 mm (1 in)
Armament: nine 152-mm (6-in), four 102-mm (4-in) AA, and eight 2-pdr AA guns
Aircraft: 21
Complement: 750 excluding aircrew



HMS Eagle *photographed from a 'Queen Elizabeth' class battleship, probably HMS* Malaya, *in the Mediterranean, March 1942. During that month* Eagle *made three sorties to Malta, flying off a total of 31 Spitfire Mk Vs.*

UK

HMS *Hermes*

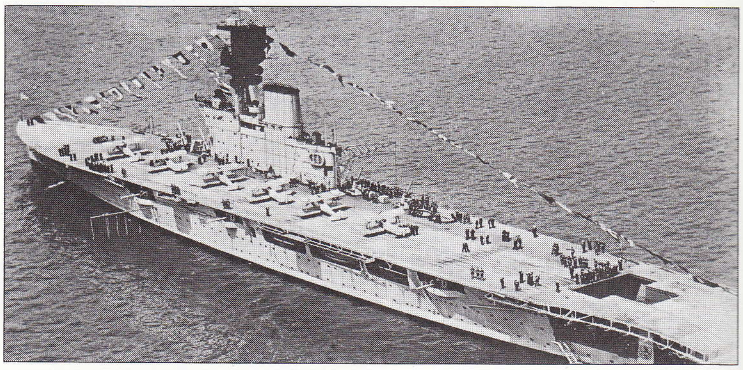
The *Argus* concept was obviously considered sound for early in 1918, before her completion, the keel was laid down for HMS ***Hermes***. Though she was designed for the job, it was obviously not with the benefit of operational experience. Lacking a precedent, her designers made her too small, prompting the Japanese to repeat the error with their pioneer *Hosho*, laid down in the following year. With the end of World War I, construction was leisurely, the ship being launched in September 1919 and with completion delayed until 1923. As a result she entered service after the much larger but converted HMS *Eagle*, which had meanwhile proved the idea of the island superstructure. Like that of the *Eagle, Hermes*' island seemed disproportionately large, with a massive battleship-style tripod and fighting top, bearing rangefinders for the unusual armament of six 140-mm (5.5-in) guns: early carriers were expected to be able to repel light surface attack, the potential of their aircraft not having been fully evaluated. A light armour belt was also worked in. An improvement on the *Argus* was a doubling of installed power to give a speed increase of over 4 kts.

A distinctive feature on the after flightdeck was a low hump, designed to decelerate incoming aircraft. This was also copied by the Japanese, but neither fleet found it a success and abandoned it.

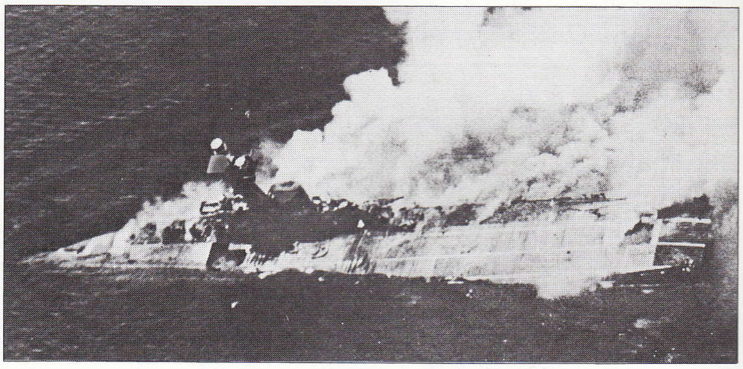
Though obsolete by World War II, the *Hermes* made an extremely valuable contribution in lower-threat areas. This found her hunting for raiders in the Atlantic, undertaking spotting and reconnaissance missions in operations against the Vichy French in West Africa and the Italians in the Red Sea, giving shore support during the suppression of the Iraqi rebellion of 1941 and escorting Indian ocean convoys. She was sunk in April 1942 off Ceylon during the Japanese carrier raids, but had adequately demonstrated the value of even a small flightdeck in areas where no other aviation support existed.

Specification

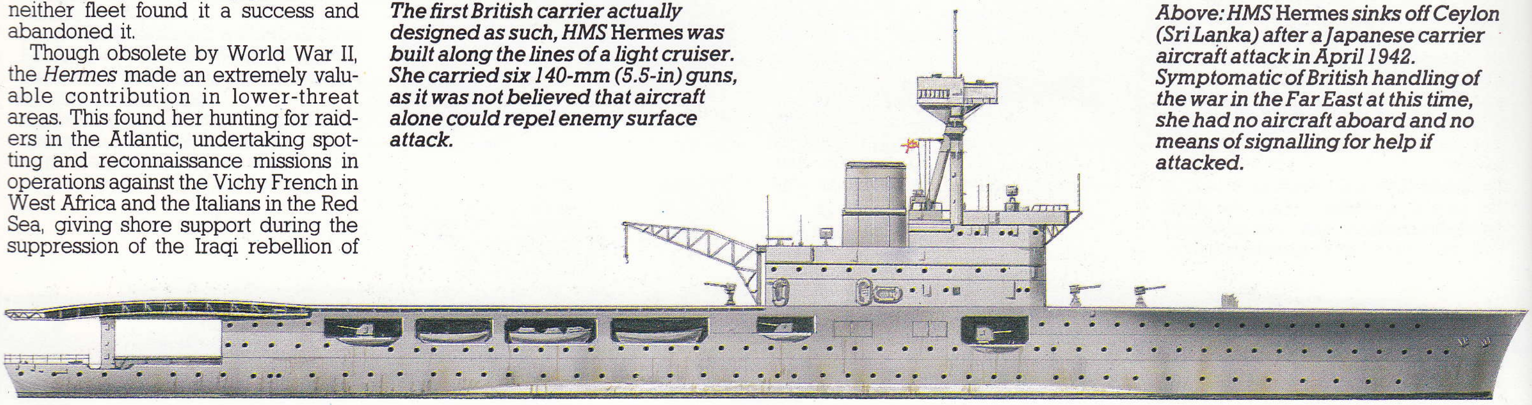
HMS *Hermes*
Type: second-line light aircraft-carrier
Displacement: 10,850 tons standard and 12,950 tons full load
Dimensions: length 182.3 m (598 ft); beam 21.4 m (70.25 ft); draught 6.9 m (22.6 ft)
Propulsion: 2-shaft geared steam turbines delivering 40,000 shp (29828 kW)
Speed: 25 kts
Armour: belt 51-76 mm (2-3 in); hangar deck 25 mm (1 in) shields 25 mm (1 in)
Armament: six 140-mm (5.5-in), and three 102-mm (4-in) AA guns
Aircraft: about 20
Complement: 660 excluding aircrew



HMS* Hermes *served in the Far East for most of her career. This photograph clearly shows her unusually large island superstructure. Purpose-built, she carried almost as many aircraft as* Eagle, *a ship of twice her displacement.



Above: HMS* Hermes *sinks off Ceylon (Sri Lanka) after a Japanese carrier aircraft attack in April 1942. Symptomatic of British handling of the war in the Far East at this time, she had no aircraft aboard and no means of signalling for help if attacked.



The first British carrier actually designed as such, HMS* Hermes *was built along the lines of a light cruiser. She carried six 140-mm (5.5-in) guns, as it was not believed that aircraft alone could repel enemy surface attack.

The Washington Treaty

The 1922 Washington Treaty put a temporary stop to the frantic warship construction which preceded World War I, but placed few restrictions on the building of aircraft-carriers. The race to produce the best carrier design had begun.

For the purposes of the Washington Treaty of 1922, Part 4 defined an aircraft-carrier as any warship exceeding 10,000 long tons for the 'specific and exclusive' purpose of carrying aircraft so constructed as to enable aircraft to be 'launched therefrom and landed thereon'. Signatories were allowed to build any number up to the agreed total tonnage ceilings in Article VII, which were 135,000 long tons each for the UK and the USA, 81,000 for Japan and 60,000 each for France and Italy. Article IX stated that no individual ships should exceed 27,000 tons (standard), but powers could build up two not exceeding 33,000 tons provided that the agreed ceilings were not breached. For this purpose, interestingly, the contracting powers could convert ships 'whether constructed or in the course of construction', which would otherwise be scrapped under the capital ships limitation clauses. Up to 10 guns of between 152- and 203-mm (6- and 8-in) calibre could be fitted with no restriction on smaller weapons (Article X). Except in cases of loss, carriers could, under Part 3, be replaced only 20 years after their completion dates but those already existing or building could be regarded as 'experimental' and be replaced at any time subject to the total tonnage ceilings.

To put this in the context of the time (1921-2), it should be remembered that both the UK and Japan were still building their first, small carriers designed for the purpose, while the USA was converting a fleet collier to its CV.1. France and Italy had hardly considered the subject. Suddenly, from the leisurely falterings of the first generation of carriers, the signatories found themselves with the parameters defined for the second generation, written to make full use of a plentitude of incomplete capital ship hulls.

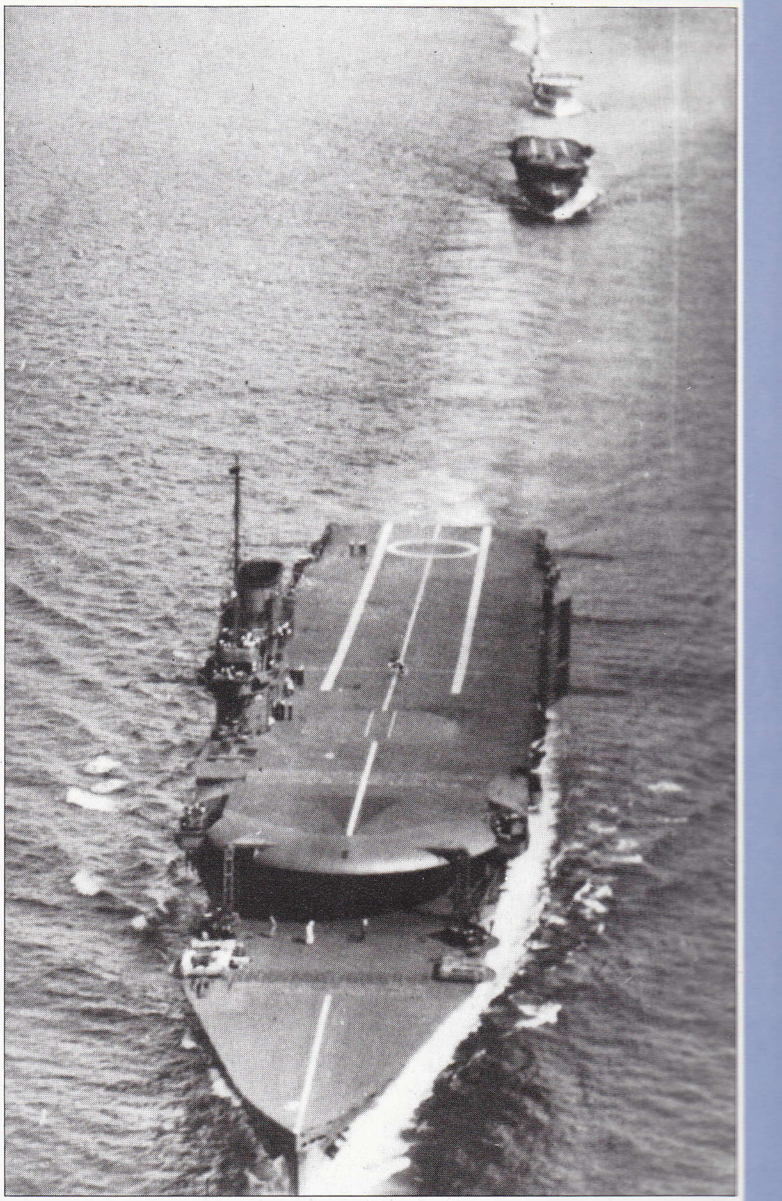
Thus the Americans were able to apply the results of a design study to the hulls of two battle-cruisers. These, completed in 1927 as the USS *Lexington* (CV.2) and USS *Saratoga* (CV.3) were 270.5-m (887.5-ft) 34-kt monsters compared with the 165.4-m (542.6-ft) 15-kt USS *Langley* (CV.1) of only five years earlier, with no intermediate evolutionary stages. The 33,000-ton official 'treaty' displacement was exceeded by about 10 per cent.

The Japanese followed a similar path with the *Akagi* and *Kaga*. Both, for no good reason other than lack of experience, were fitted with a 203-mm (8-in) main battery, demonstrating again that treaty limitations tend to become targets where no target previously existed. Unsure of what they had done, both fleets reverted temporarily to smaller ships, (USS *Ranger* and *Ryujo*) whose practical limitations served to underline that bigger was better.

The British, with more available hulls and more experience, opted for a pair of 22,500-tonners, HMS *Glorious* and HMS *Courageous* which, with only 120-mm (4.7-in) guns were in no way treaty-limited. By conservative design and 'thinking small' the Royal Navy found itself in 1930 with six carriers carrying far fewer aircraft in total than the three carriers available to the Americans, seemingly a deliberate policy.

In the Mediterranean, the Italians considered carriers unnecessary and, but for the treaty, the French would probably have thought similarly. The choice of 'scrap or convert', however, persuaded them to produce the *Béarn*, too small and too slow for the job. Her unsuccessful design was to influence French thought away from naval aviation for many years.

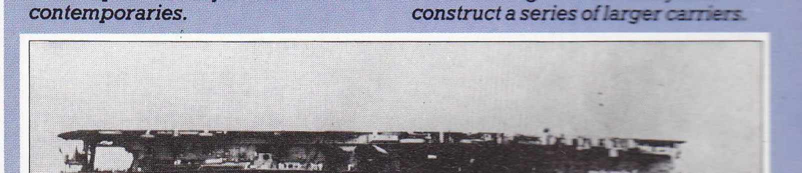
Where the Washington Treaty successfully curbed rivalries in capital ship construction it unwittingly boosted competition in both carriers and cruisers, both of which developed rapidly in their technology as a result.



The cautious attitude of naval planners led the Royal Navy to operate smaller aircraft-carriers than the Americans or Japanese. HMS** Courageous, Furious **and** Glorious, **seen here in 1933, carried 120 aircraft in total. Only** Furious **was destined to survive the war.

Left: Built from the hulls of massive battlecruisers which were cancelled because of the treaty, the 'Lexington' class had bigger hangars than any carrier built until 1945. Carrying 80 aircraft and capable of 34 kts, they were superior to any of their contemporaries.

Below: After building** Akagi **and** Kaga, **30,000-ton carriers with 60 aircraft each, the Japanese experimented with putting 48 aircraft into an 8,000-ton cruiser hull, the** Ryujo. **Unimpressed, they resolved to ignore the treaty and construct a series of larger carriers.



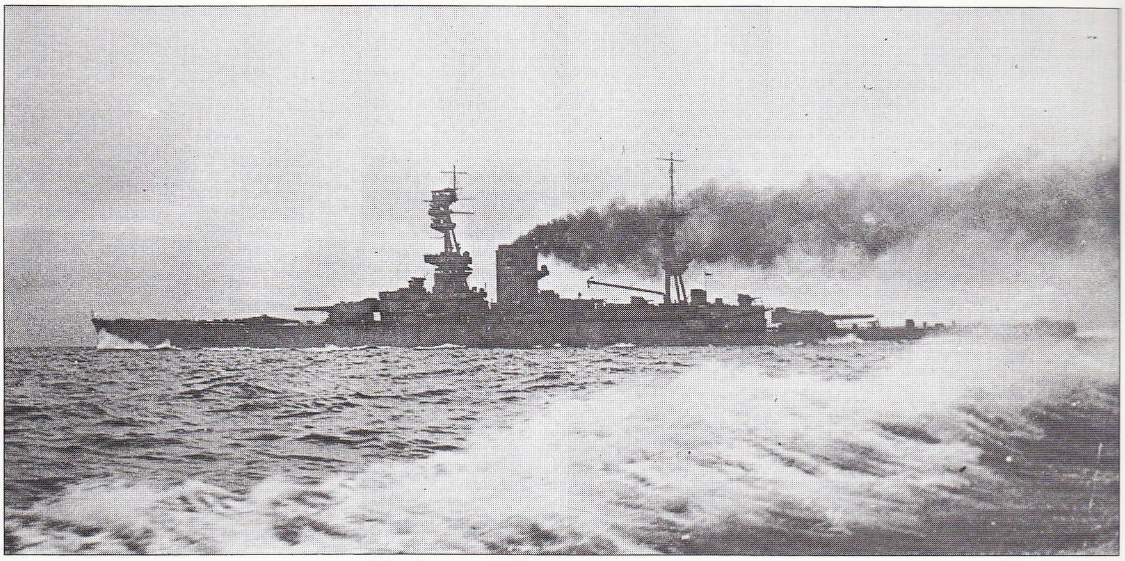
UK

HMS *Courageous* and HMS *Glorious*

Known, for political reasons, as large light cruisers, Jackie Fisher's famous trio of light battle-cruisers were supposed to be the largest units of a 600-strong, shallow-draught armada constructed to realize his vision of landing an army on the Baltic coast of Germany, only 130 km (80 miles) from Berlin. The plan died with Fisher's departure from the Admiralty in 1915 but his strange ships were completed as a legacy. Ready for sea in 1917, the first two were HMS ***Courageous*** and HMS ***Glorious*** (laid down in 1915, and launched in February and April 1916), but were found to be virtually unemployable in the active fleet, unprotected and, with only four of their great 381-mm (15-in) guns, slow to get on to the target. On the only occasion when they saw serious action, against conventional light cruisers, they suffered more damage than they inflicted.

Under the terms of the Washington Treaty, the two ships were eligible for conversion into aircraft-carriers. Rebuilding of both started in 1924, the *Courageous* completing in 1928 and the *Glorious* in 1930. *Furious* (with no island) had had her uptakes led well aft, detracting from her hangar space, but these later conversions had the benefit of developments on the *Hermes* and *Eagle*, their combined funnel and bridge structure boosting their air complement considerably. The *Courageous* and *Glorious* had similar forward flightdecks, which terminated about 20 per cent of the ship's length back from the bows. The hangar deck was extended forward at forecastle level, allowing fighters to take off from the lower level in favourable circumstances. Both ships were extensively bulged to improve stability.

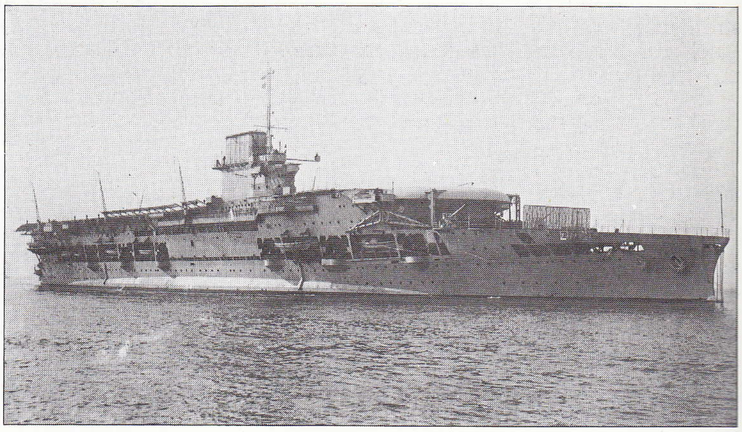
The *Courageous* was the Royal Navy's first major casualty of World War II, being sunk only a fortnight after hostilities commenced. Her loss brought the *Glorious* back from the Mediterranean as a replacement and she, too, was lost only nine months later during the evacuation of Norway.



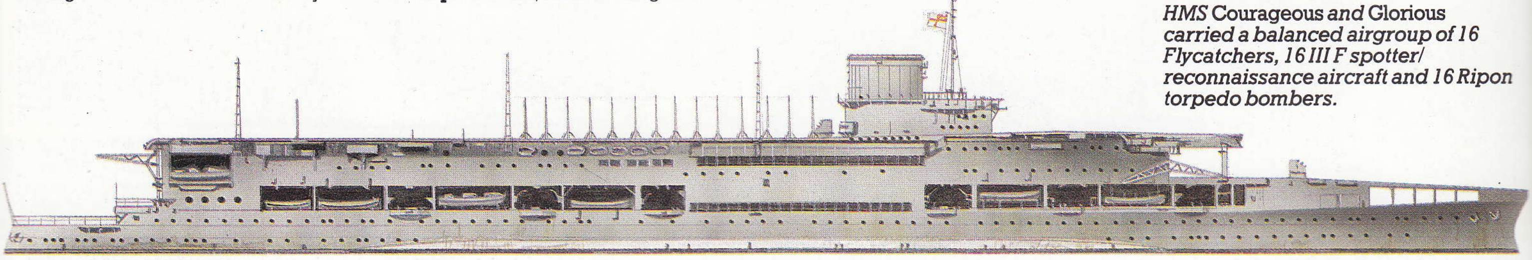
HMS Courageous and Glorious, *like* Furious, *were light battlecruisers intended for Admiral Fisher's ill-conceived Baltic strategy. This is* Glorious *on her sea trials in 1917. Her speed was an impressive 31 knots but her lack of armour made her unfit for serious combat.*

Specification

'Courageous' class
Type: fleet aircraft-carrier
Displacement: 22,500 tons standard and 26,500 tons full load
Dimensions: length 239.5 m (785.75 ft); beam 27.6 m (90.5 ft); draught 7.3 m (24 ft)
Propulsion: 4-shaft geared steam turbines delivering 90,000 shp (67113 kW)
Speed: 31 kts
Armour: belt 38-76 mm (1.5-3 in); hangar deck 25-76 mm (1-3 in)
Armament: 16 120-mm (4.7-in) AA guns
Aircraft: about 45
Complement: 1,215 including aircrew



HMS Glorious *could be distinguished from her sister by her longer flight deck aft. Her aircraft gave sterling service over Norway in 1940, but she was caught and sunk during the withdrawal by the German battlecruisers* Scharnhorst *and* Gneisenau.



HMS Courageous *and* Glorious *carried a balanced airgroup of 16 Flycatchers, 16 III F spotter/ reconnaissance aircraft and 16 Ripon torpedo bombers.*

UK

HMS *Ark Royal*

Completed in 1938, HMS ***Ark Royal*** was the Royal Navy's first 'modern' carrier. A combination of meagre naval budgets and the lowly status of the Fleet Air Arm meant that she was the first carrier to join the fleet since the remodelled *Glorious* back in 1930. Plenty of time had thus been available to plan her, resulting in a thoroughly workmanlike and influential design laid down in 1935 and launched in April 1937. Though much of a size and displacement as the *Glorious*, she appeared much larger, having two levels of hangars with adequate headroom. Three elevators were incorporated but they were small and, had the ship enjoyed a longer career, would have required replacement to cater for the rapidly increasing size of aircraft. She had two catapults ('accelerators') from the outset.

The *Ark Royal*'s most innovatory feature was her strength, the ship introducing armoured flight and hangar decks, with the hangar walls an integral part of the main hull girder. Despite the space-consuming aspects of this configuration, she could stow a far greater number of aircraft than the *Glorious*. Capable of 31 kts, she was also as fast as the earlier ships.

Though the earlier conversions had 16 medium-calibre guns, these were poorly sited, mainly with a view to defence against surface attack. The *Ark Royal* carried eight twin-barrelled destroyer-type mountings, with high elevations conferring a true dual-purpose capability and sited four on each beam at the flightdeck edges to give good firing arcs. Designers were, at last, alive to the dangers of air attack and a comprehensive fit of smaller automatic weapons was also incorporated. Though aircraft were, indeed, to prove the main hazard to both American and Japanese carriers, the Royal Navy was pitted primarily against fleets without carriers, so suffering most of its carrier casualties, the *Ark Royal* included on 14 November 1941, from submarine attack.

Specification

HMS *Ark Royal*
Type: fleet aircraft-carrier
Displacement: 22,000 tons standard and 26,700 tons full load
Dimensions: length 243.8 m (800 ft); beam 28.9 m (94.75 ft); draught 6.9 m (22.66 ft)
Propulsion: 3-shaft geared steam turbines delivering 102,000 shp (76061 kW)
Speed: 31 kts
Armour: belt 114 mm (4.5 in); deck 64 mm (2.5 in)
Armament: eight twin 114 mm (4.5-in) AA, six octuple 2-pdr AA, and eight quadruple 12.7-mm (0.5-in) AA guns
Aircraft: about 65
Complement: 1,575 including aircrew

Ark Royal in Action

***The most famous of British carriers in World War II,* Ark Royal *was the Royal Navy's first purpose-built large carrier. Despite repeated German claims to have sunk her, she battled on until November 1941, when she fell victim to a U-boat. During her short career she saw action against the Vichy French in North Africa, fought her way to Malta and struck the decisive blow against the German battleship* Bismarck.**

Though the war career of HMS *Ark Royal* spanned only a brief 27 months, these were so packed with incident that the ship seemed to be rarely out of the headlines. Still a new ship, she was attached to the Home Fleet at Scapa when hostilities opened. Events started quietly at sea with only the enemy's U-boats particularly active, but the naval policy of aggressive patrolling put the big ships in harm's way, and the *Ark Royal* was narrowly missed by submarine torpedoes on 14 September 1939. She was fortunate for, only three days later, HMS *Courageous* was lost to a similar attack. Carriers were eventually to prove the masters of the U-boat, but the time was still well in the future.

Within a fortnight, the fleet was at sea in strength to cover a stricken submarine and Blackburn Skuas from the *Ark Royal* chalked up a 'first' by shooting down an enemy shadower, the first Luftwaffe casualty to the RN. The price was still a stiff dive-bombing attack that narrowly missed her.

The following month saw the *Ark Royal* detached to join Force K in the equatorial Atlantic, to engage in a search for an active enemy raider. Her aircraft gained great experience in area search, locating enemy supply ships and disrupting their organization. Unfortunately the raider, which turned out to be the *Graf Spee*, was apprehended much farther south. Some consolation was gained early in 1940 when, on the ship's return north, her aircraft were instrumental in the interception of no less than five out of six enemy merchantmen that were endeavouring to reach home from internment in Spain.

When Germany invaded Norway in April 1940, the *Ark Royal* was in the still-quiet Mediterranean for a spell of training. Two of her Skua squadrons, however, were in the UK and on 10 April 15 of these aircraft, working from the Orkneys to the limit of their range, dive-bombed and sank the German cruiser *Königsberg* in the port of Bergen. This was another naval record, being the first instance of a major warship sunk in action by air attack.

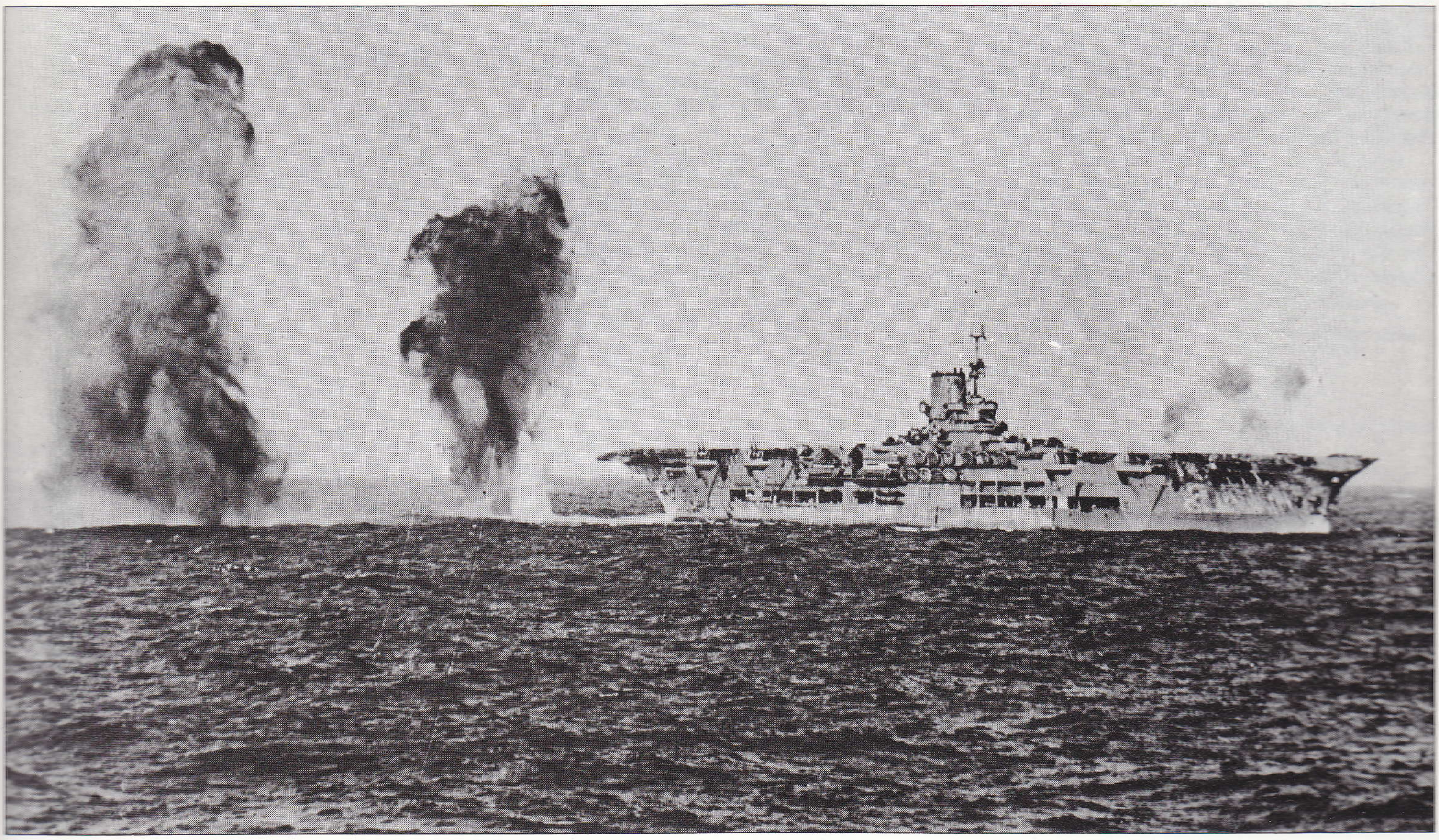
With HMS *Furious* the only carrier in home waters, both the *Ark Royal* and HMS *Glorious* were returned with all despatch. Throughout the whole melancholy campaign until the inevitable Allied evacuation during June, their aircraft were active over land as well as sea, the attrition rate being high. During the withdrawal, the *Glorious* was sunk by enemy surface action, but though the *Ark Royal* was at sea she was unable to intervene as she was escorting a vital troop convoy.

The enemy gained Norway, but his fleet suffered severely in the process, so the *Ark Royal* could reasonably be spared to proceed to Gibraltar, for in the same month the Mediterranean balance had changed completely with the fall of France and Italy's entry into the war.

Thus, following a valedictory raid on Trondheim on 13 June, when a Skua put a 227-kg (500-lb) bomb into the *Scharnhorst* (the weapon failed to explode), the carrier went south in company with HMS *Hood* to join Admiral Somerville's Force H.

The position of the French Mediterranean fleet was confusing. Its bulk lay in Toulon, immobilized under the eye of the newly-installed Vichy regime, but powerful elements lay in various ports in French African territories. At Mers-el-Kebir, near Oran, lay a force including two modern battle-cruisers and a couple of elderly battleships. Under no circumstances could the already-outnumbered British allow these powerful units to fall into enemy hands, yet French pride would not permit accession to the British alternatives of placing the ships beyond hostile reach or of destroying them.

The British cut short prevarication with an ultimatum, backed up by the arrival off the port on 3 July of Somerville's forces, including three 381-mm (15-in) gunned capital ships and the *Ark Royal*. Moored behind a substantial mole and with the town at their backs, the French worked furiously to raise steam while discussions dragged on. To prevent their sudden exit, the *Ark Royal*'s aircraft mined the marked channel, a move which unfortunately seemed to stiffen French intractability. Concerned about attack from without, the waiting British became edgy and, though the French made concessions, these did not go far enough. A final demand was not met and the British heavy units opened fire at 17.54, with aircraft spotting. Amid the vertical columns of smoke from a dozen funnels grew the masthead-high splashes of the big shells from 13715 m (15,000



***HMS* Ark Royal *fights off German air attack in the Mediterranean. In the face of heavy bomb and torpedo attacks she flew off about 170 Hawker Hurricanes to reinforce Malta in 1941. It was while returning from one such mission that she was torpedoed by* U-81.**

yards). Moored end-on, unable either to flee or to fight, the French suffered little more than ritual execution: the new battle-cruiser *Dunkerque* took a three-shell salvo and had to be beached; the old *Bretagne* exploded and capsized; and the *Bretagne*'s sister *Provence* had also to be beached to prevent her foundering. The power of the shells was immense, the complete after end of the large destroyer *Mogador* being amputated by one hit. Of the major units, only the battle-cruiser *Strasbourg* made her escape, by cutting the boom and keeping close inshore. Two bomb and torpedo strikes were mounted by the *Ark Royal* but the ship succeeded in escaping to Bizerta.

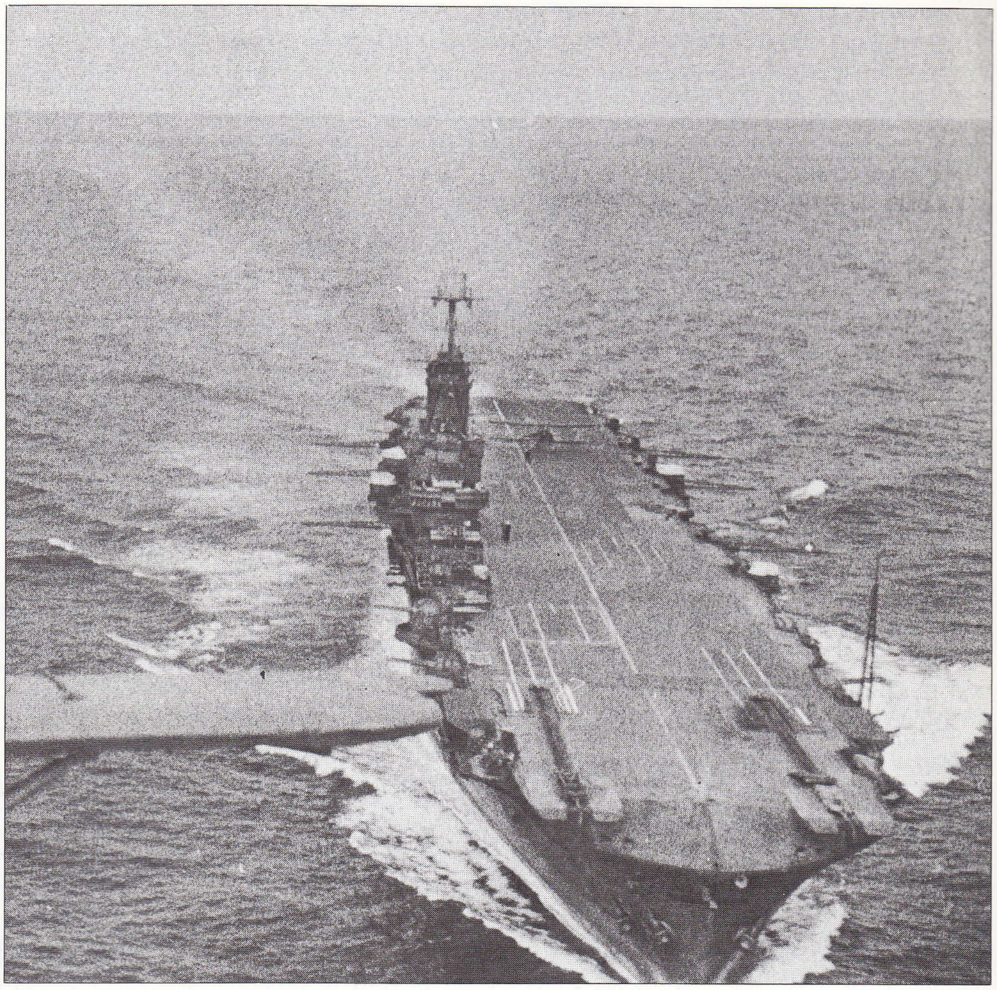
Another torpedo drop

As the beached *Dunkerque* was still thought to be a threat, the carrier returned three days later, her Fairey Swordfish aircraft carrying out a different torpedo drop within the shallow confines of the port. One hit the target without exploding but a second sank a patrol craft close aboard, this wreck then absorbing a third which triggered a full load of depth charges adjacent to the battle-cruiser's hull. The whole Oran affair was acutely distasteful to the British, but the desperate post-Dunkirk situation demanded resolute action.

A busy couple of months of operations against the Italians were followed by another against a French base, this time Dakar in Senegal. The force here had Vichy sympathies and included the brand new battleship *Richelieu*, damaged by an earlier strike from the veteran carrier HMS *Hermes*. Negotiations began, with a view to installing a Free French administration. These failed and force again had to be used, though the whole affair was a failure. Despite the *Ark Royal*'s aircraft being used widely for spotting, reconnaissance and ground support, the planned French landing did not succeed and the operation was abandoned with several ships damaged. As sole source of aerial support, the *Ark Royal* had achieved another 'first', but her aircraft had been badly outclassed by the French land-based machines and suffered nine losses.

A short refit in the UK included the necessary updating of her fighter complement from Skuas to Fairey Fulmars, but the *Ark Royal* was back with Force H in early November, spotting for the bombardment of Genoa, softening-up Italian airfields before the Taranto raid, ferrying fighters and escorting convoys to Malta, and having a direct brush with the Italian fleet, which retired immediately on observing the presence of the carrier.

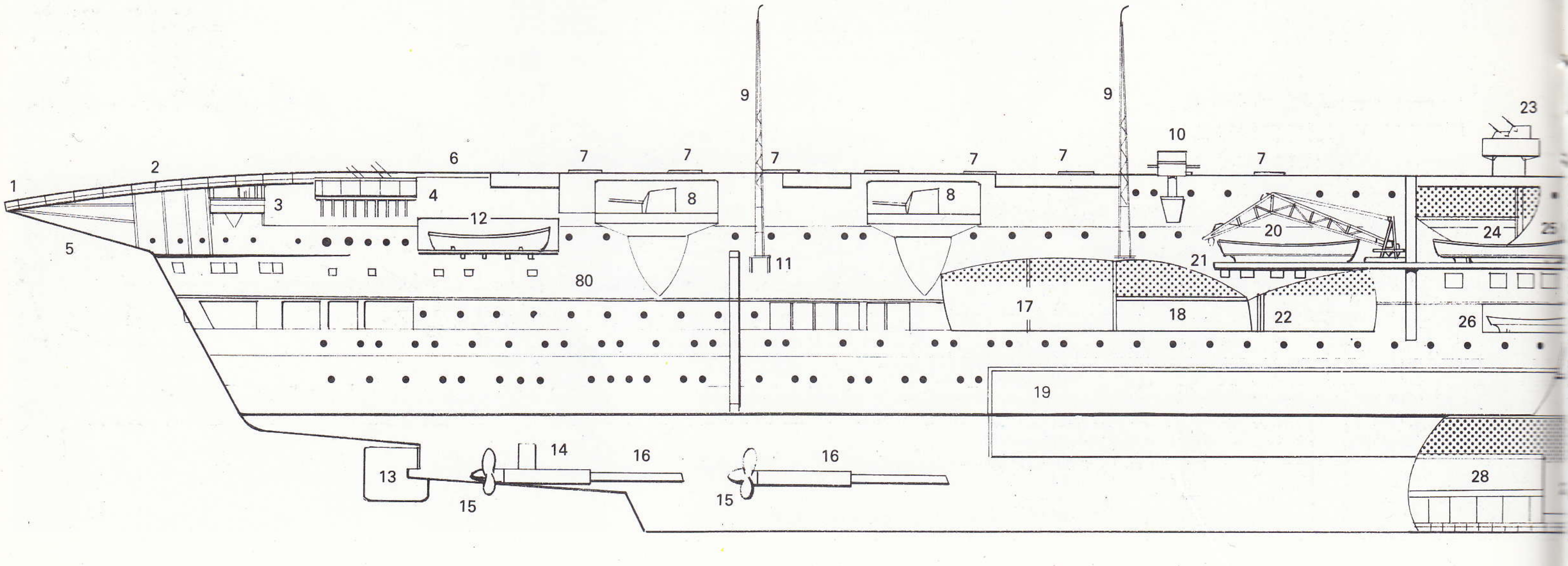
In March 1941 Force H narrowly missed apprehending a particularly sought-after quar-

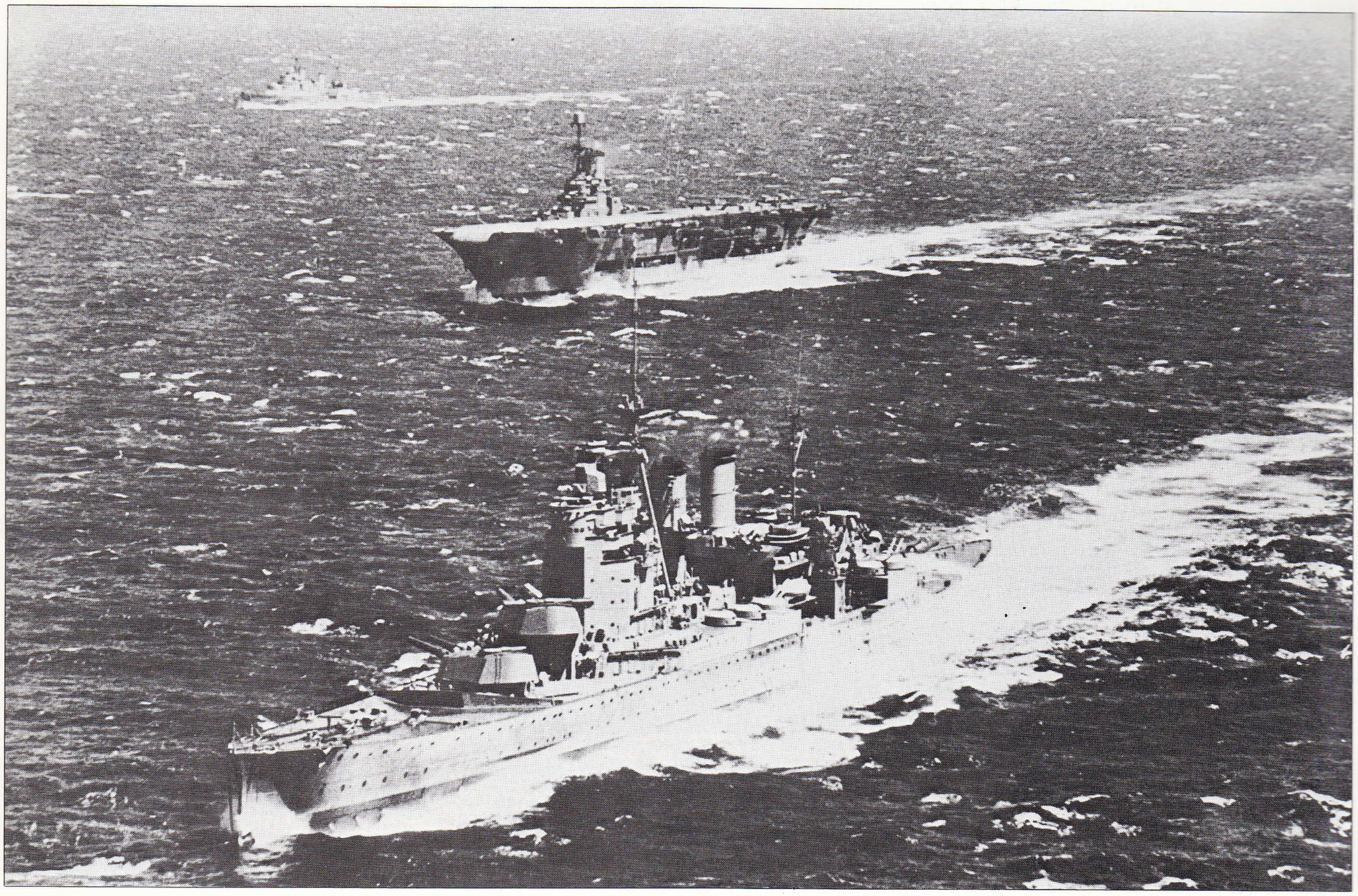


Ark Royal *played a major role in the British attacks on the French fleet during 1940. Her aircraft mined Mers-el-Kebir to prevent the French escaping, but at Dakar in Senegal her aircraft were roughly handled by French land-based fighters.*

HMS *Ark Royal* cutaway drawing key

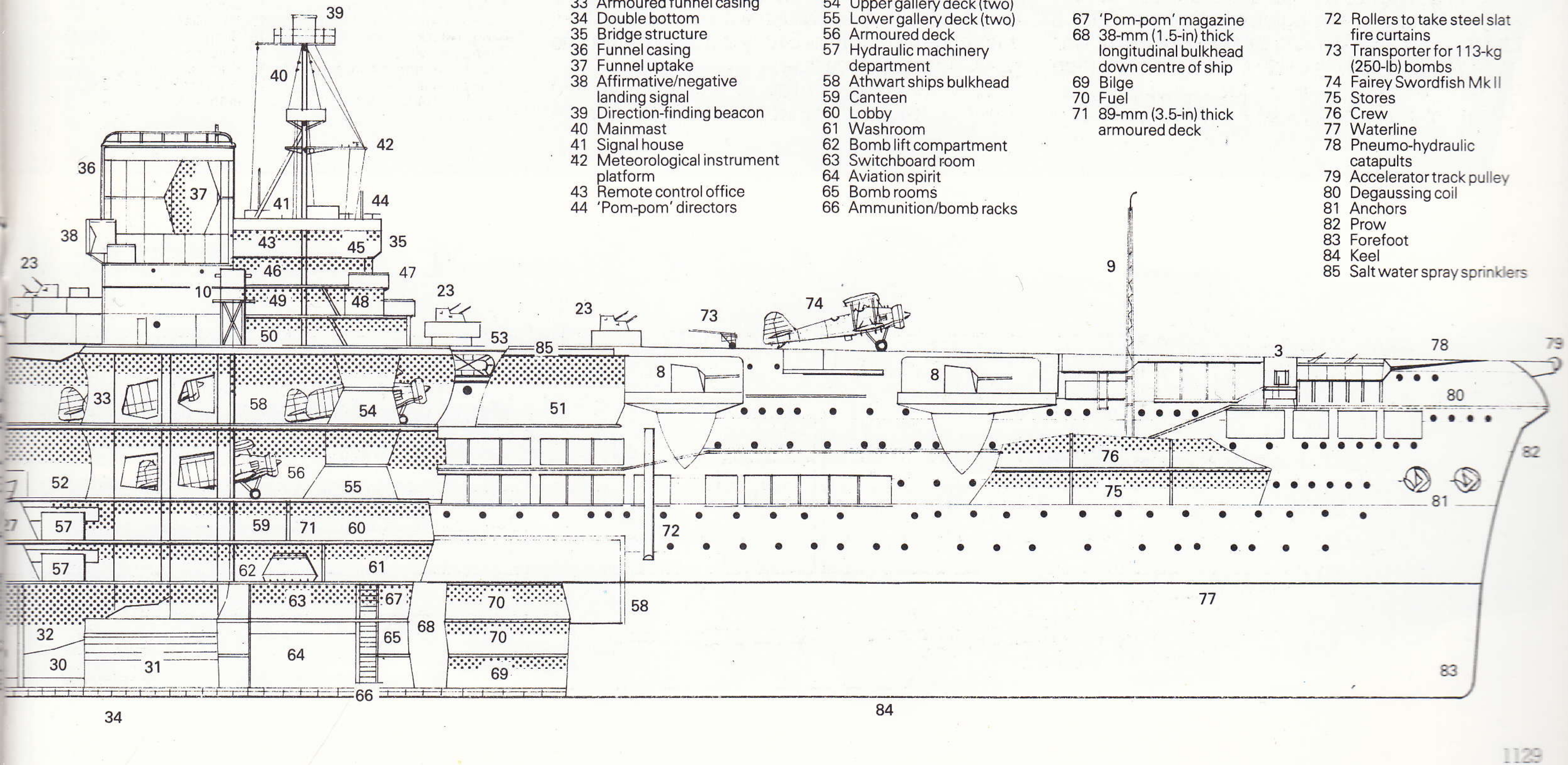
1 Safety net
2 Round down
3 Searchlight
4 Multiple machine-guns
5 Additional supports for overhang
6 Flight deck
7 Arrester wires
8 Twin 114-mm (4.5-in) guns
9 Radio aerials
10 114-mm (4.5-in) gun fire director
11 Hinged platform for radio aerials
12 Motor cutter
13 Balanced rudder
14 Support
15 Propeller
16 Shaft
17 Aviation store lobbies
18 Companionway
19 114-mm (4.5-in) thick armour belt



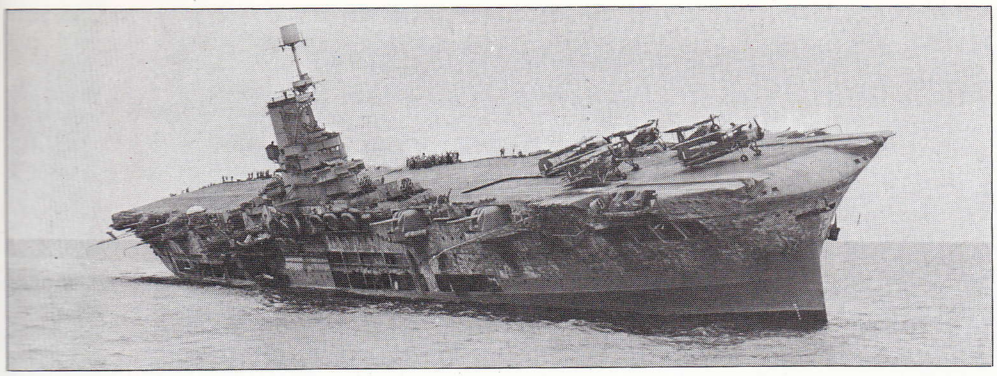


Force H: Ark Royal, *the battlecruiser* Renown *and the cruiser* Sheffield. *During the hunt for the* Bismarck, Ark Royal*'s Swordfishes attacked* Sheffield *by mistake but made up for their error by crippling* Bismarck*'s steering by a daring torpedo attack delivered in appalling weather conditions.*

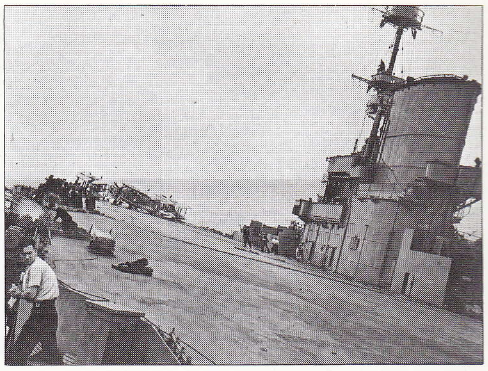
20 Crane (handles 5443 kg/12,000 lb weight)
21 Motor pinnace
22 Fireproof curtain
23 Multiple eight-barrelled 'pom-pom' gun
24 Hangar lift
25 9-m (30-ft) motor cutter
26 Cutter
27 64-mm (2.5-in) thick armour deck
28 Turbine
29 Engine room
30 Boiler room
31 Boiler
32 Bulkhead dividing boiler rooms
33 Armoured funnel casing
34 Double bottom
35 Bridge structure
36 Funnel casing
37 Funnel uptake
38 Affirmative/negative landing signal
39 Direction-finding beacon
40 Mainmast
41 Signal house
42 Meteorological instrument platform
43 Remote control office
44 'Pom-pom' directors
45 Admiral's bridge
46 Plotting office
47 Compass platform
48 Wheel house
49 Air intelligence office
50 Meteorological office
51 Upper hangar
52 Lower hangar
53 Liferaft(s)
54 Upper gallery deck (two)
55 Lower gallery deck (two)
56 Armoured deck
57 Hydraulic machinery department
58 Athwart ships bulkhead
59 Canteen
60 Lobby
61 Washroom
62 Bomb lift compartment
63 Switchboard room
64 Aviation spirit
65 Bomb rooms
66 Ammunition/bomb racks
67 'Pom-pom' magazine
68 38-mm (1.5-in) thick longitudinal bulkhead down centre of ship
69 Bilge
70 Fuel
71 89-mm (3.5-in) thick armoured deck
72 Rollers to take steel slat fire curtains
73 Transporter for 113-kg (250-lb) bombs
74 Fairey Swordfish Mk II
75 Stores
76 Crew
77 Waterline
78 Pneumo-hydraulic catapults
79 Accelerator track pulley
80 Degaussing coil
81 Anchors
82 Prow
83 Forefoot
84 Keel
85 Salt water spray sprinklers



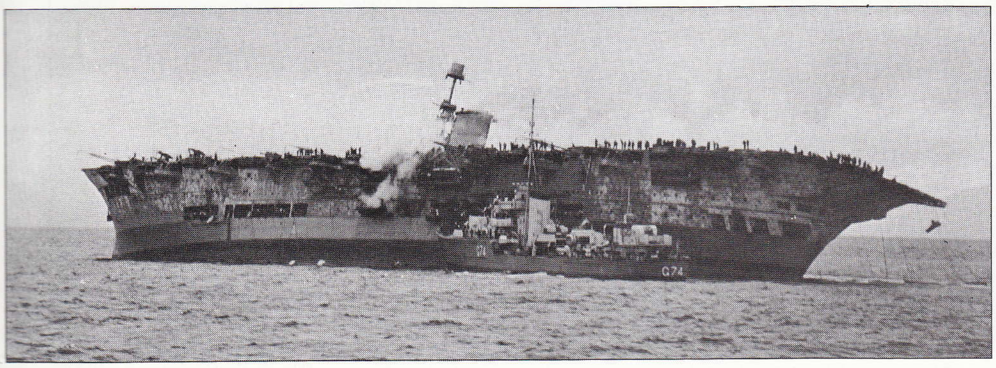
Ark Royal in Action



While returning to Gibraltar after ferrying aircraft to Malta, Ark Royal *was attacked by German submarine U-81 and hit on the starboard side by a single torpedo.*

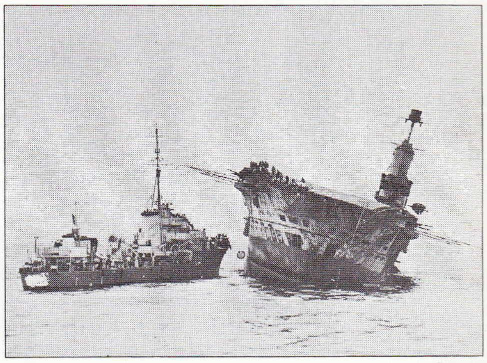


Heavy flooding choked the boiler uptakes, which were vented through one large funnel; total power failure resulted and a severe list developed.

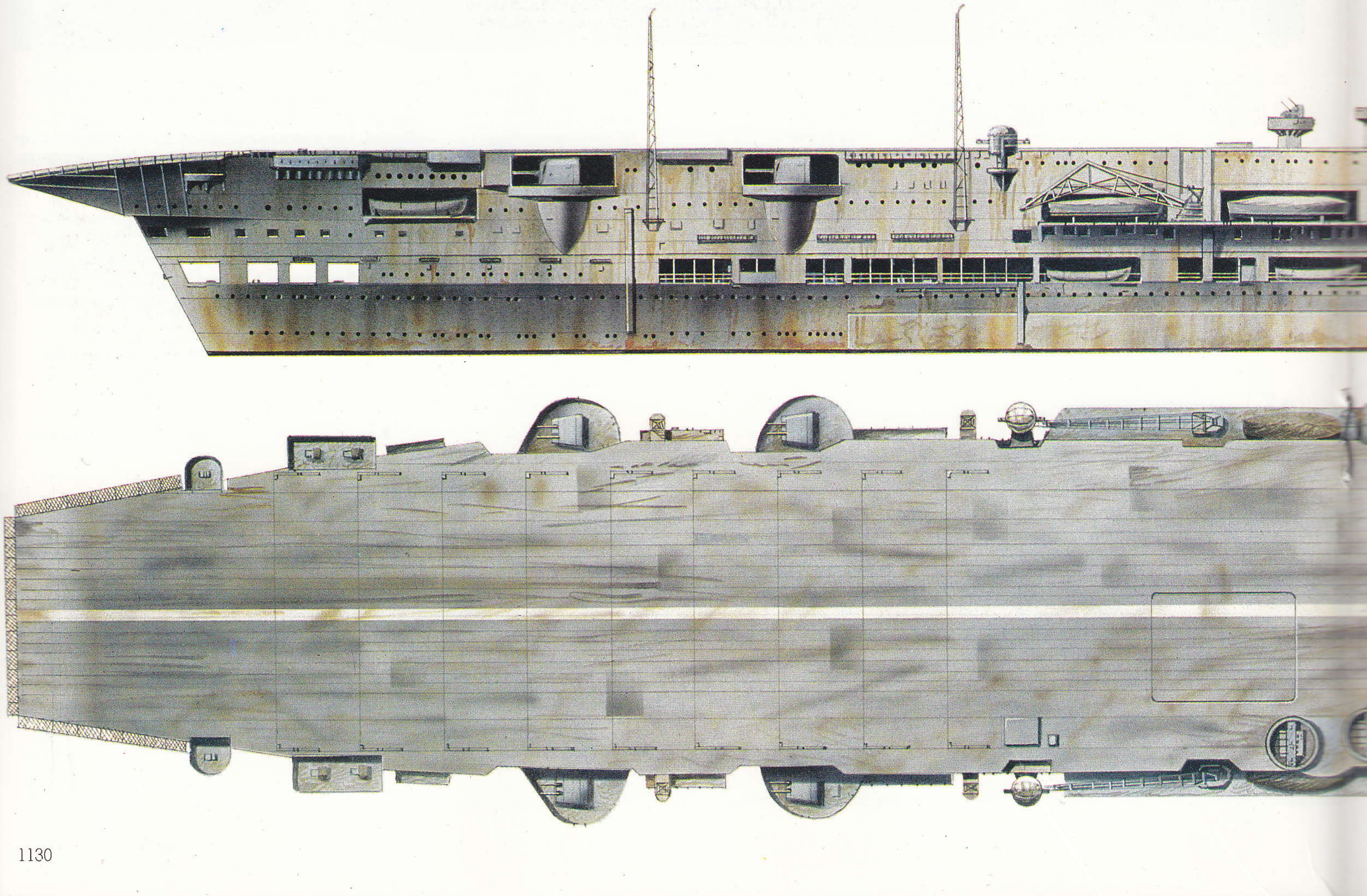


Crew members gather on deck as an 'L' class destroyer arrives alongside the stricken carrier.

Salvage tugs raced to the scene, but meanwhile the flooding continued unchecked.



As the list increased, the order was given to abandon ship and in the small hours of 14 November Ark Royal *sank to the bottom.*



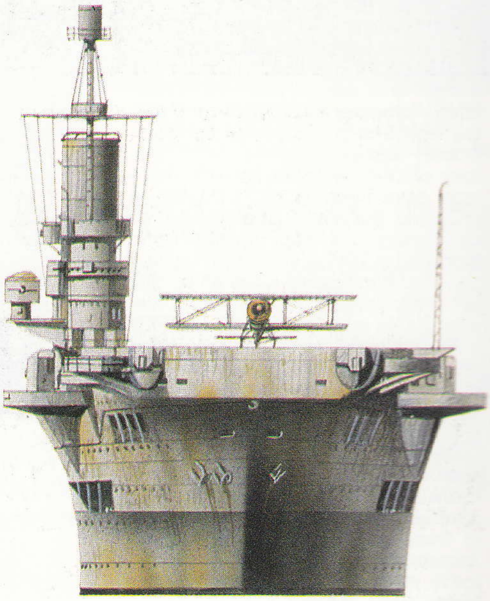
ry, the German fast battleships (or battlecruisers) *Scharnhorst* and *Gneisenau*, returning after a successful commerce raid. Though an aircraft from the *Ark Royal* actually sighted them some 965 km (600 miles) off Cape Finisterre, a combination of communication problems and evasive manoeuvring on the part of the enemy prevented further contact.

Two months later another German raider brought Force H into the Atlantic again. This time it was the *Bismarck*. Early on 24 May the enemy sank the *Hood* while breaking out of the Denmark Strait but, damaged in the process, had to make for home shadowed by two British cruisers. These were able to vector in the new carrier HMS *Victorious* whose aircrews, despite their inexperience, succeeded in putting a torpedo into the battleship's midship section. Unfortunately, the injury was insufficient to stop the ship, which then managed to shake off the cruisers. With a dawn air search from the *Victorious* failing to re-establish contact, there began an anxious 32 hours until a Consolidated Catalina sighted her, trailing oil but clear of the Home Fleet and well on her way to Brest. Force H had, however, been brought north for just such an eventuality and was well placed. An *Ark Royal* aircraft was in touch by noon on 26 May and, despite appalling weather conditions, an aerial torpedo strike was launched. It was bad luck that the radar-fitted cruiser HMS *Sheffield* had gone on ahead, for the Swordfish leader also attacked by radar through the low cloud base, wasting the torpedoes on the wrong ship, which skilfully avoided them. A further five hours elapsed before another strike could be mounted. In conditions that would have aborted flying in peacetime, the aircraft took off and flew via the *Sheffield* to the target. Two hits were scored, one severely damaging a rudder and propeller shaft. Now slowed significantly, the *Bismarck* was harried throughout the night by destroyers before being sunk after a gunnery duel on the following morning. Success was a close-run thing and would not have been possible without carrier support.

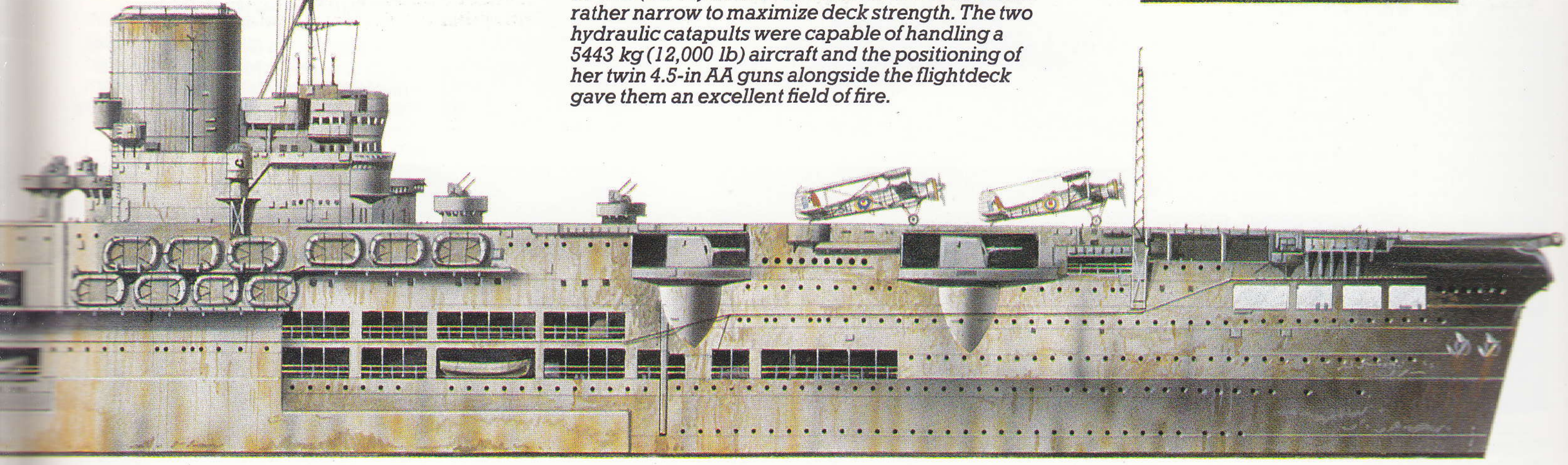
A more mundane but hazardous task was the constant ferrying of fighters to Malta. Between April and September 1941, sometimes in company with another carrier, the *Ark Royal* carried about 170 Hawker Hurricanes to the island at a period of high attrition. She also covered two major convoys, one in July ('Substance') and one in September ('Halberd') which, despite every enemy effort, lost only one merchantman out of the 25 involved.

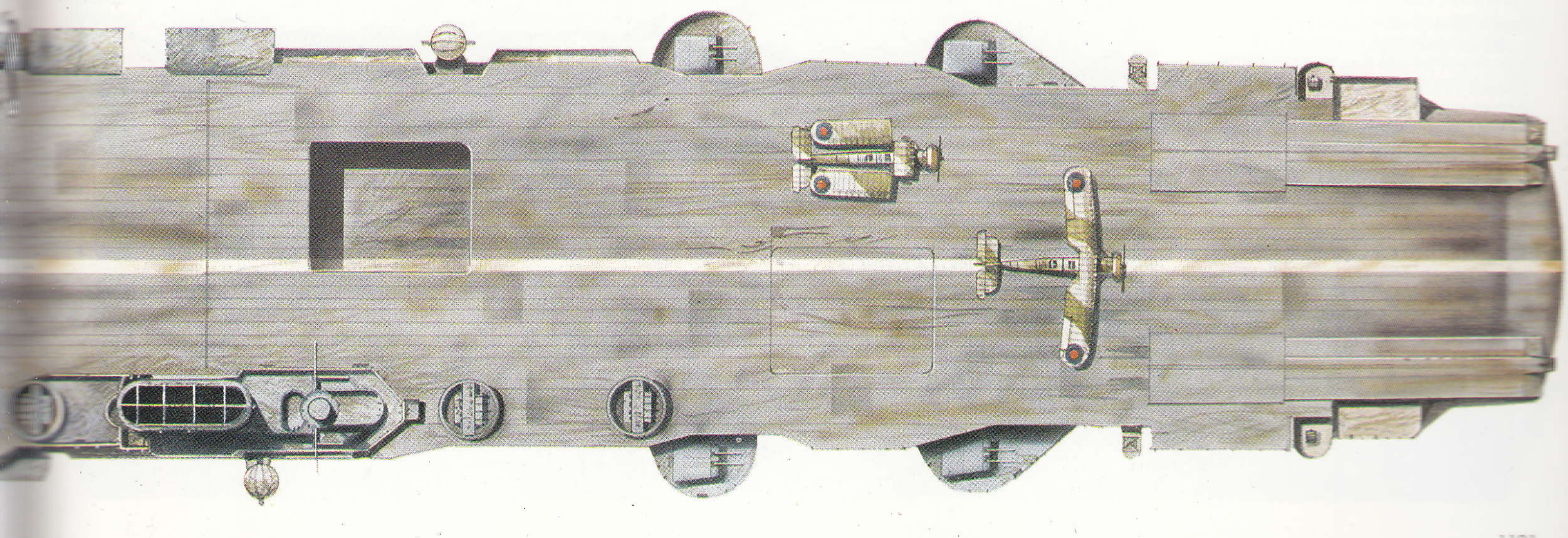
On 13 November 1941 the *Ark Royal*'s luck ran out. Returning to Gibraltar from yet another ferrying trip to Malta, she was hit by a single torpedo from *U-81*. Only 80 km (50 miles) from harbour, she had a good chance initially but all power failed, leading to uncontrolled flooding. The resultant alarming list brought about a premature abandonment. Neither of her escorting destroyers essayed a tow and, when salvage tugs finally arrived, they were too late to reverse the situation, the *Ark Royal* rolling over and sinking in the early hours of 14 November, some 14½ hours after being hit and only 40 km (25 miles) from safety.

The loss of one of the UK's few modern carriers was to have a profound impact on the conduct of naval operations.



Ark Royal's hull was as long as dry docking facilities would allow, and was protected by a 114-mm (4.5-in) armour belt. Her flightdeck had 64-mm (2.5-in) armour and the lifts were offset and rather narrow to maximize deck strength. The two hydraulic catapults were capable of handling a 5443 kg (12,000 lb) aircraft and the positioning of her twin 4.5-in AA guns alongside the flightdeck gave them an excellent field of fire.





UK

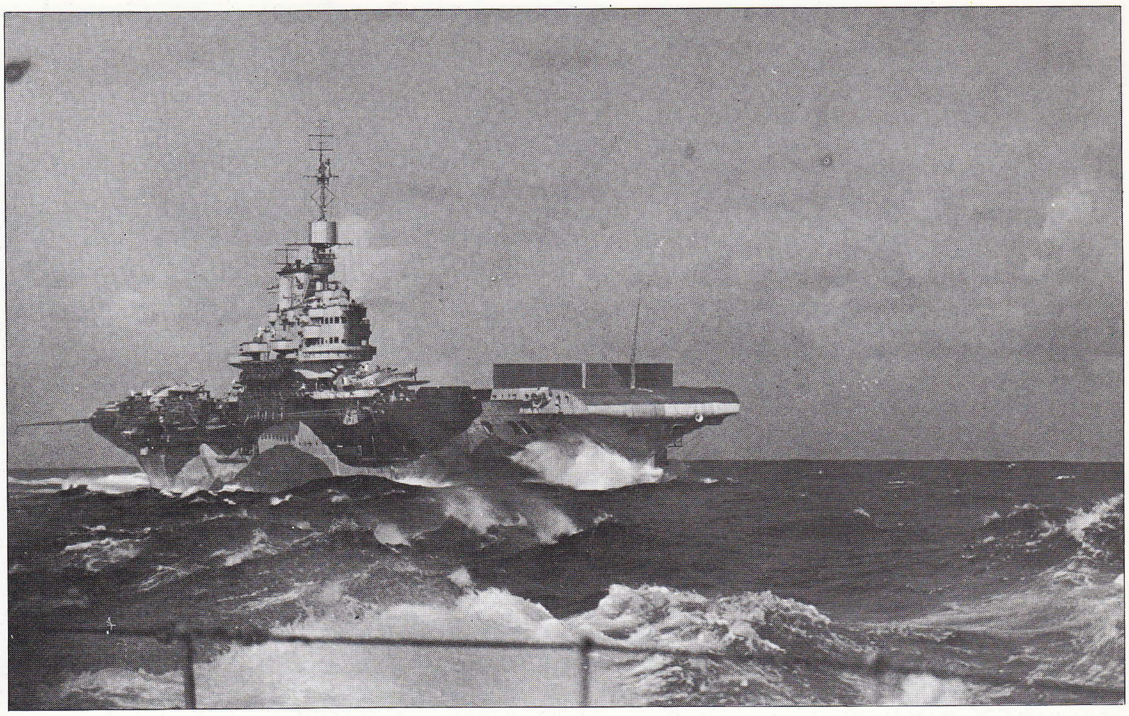
'Illustrious' class

The *Ark Royal* was very much a prototype, combining speed with capacity and new standards of protection. Though late coming, she had hardly been launched when a new **'Illustrious' class** of four aircraft-carriers was laid down in 1937 to respond to the already increasing likelihood of war. Operational experience was, therefore, not a part of the later concept, which took the scale of the *Ark Royal*'s belt and horizontal protection, and added a 114-mm (4.5-in) hangar well. Thus the whole of the vulnerable aircraft accommodation became an armoured box, but so much weight high in the ship limited the protection to only one hangar and, though HMS ***Illustrious***, HMS ***Victorious*** and HMS ***Formidable*** (all launched in 1939) were not significantly smaller than the *Ark Royal*, they carried far fewer aircraft. There must have been second thoughts on reducing the ships' primary arm so drastically, for HMS ***Indomitable***, launched in 1940 as last of the four, and the two 'Implacable' class ships that followed, reverted to lighter protection and an extra half-length hangar.

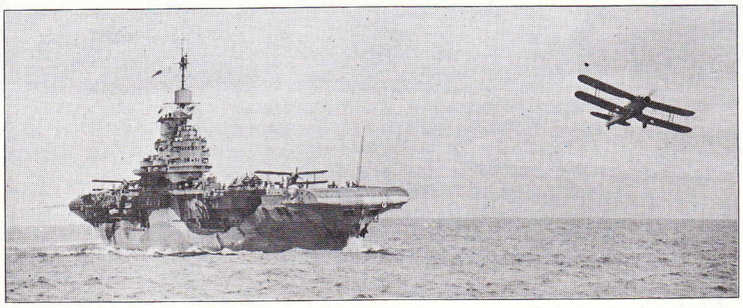
The immense strength of the ships stood them in good stead, for their war turned out to be one of air, rather than submarine attack. Soon after Taranto, the *Illustrious* survived punishment from dive-bombing that would have sunk any other carrier afloat, a performance echoed by the *Formidable* after Matapan. In the Pacific War most of them withstood one or even two *kamikaze* strikes without having to leave station. But all these immense blows were absorbed mainly by the ships' horizontal protection and it would seem in retrospect that the vertical armour was bought at an excessive price in operational efficiency even though, in the Pacific, the class worked with something like 60 per cent over its designed aircraft complement. When the Americans copied the armoured deck concept, it was not at the cost of capacity, so carrier sizes began their inevitable escalation. The ships were scrapped in 1956, 1969, 1955 and 1953 respectively.

Specification

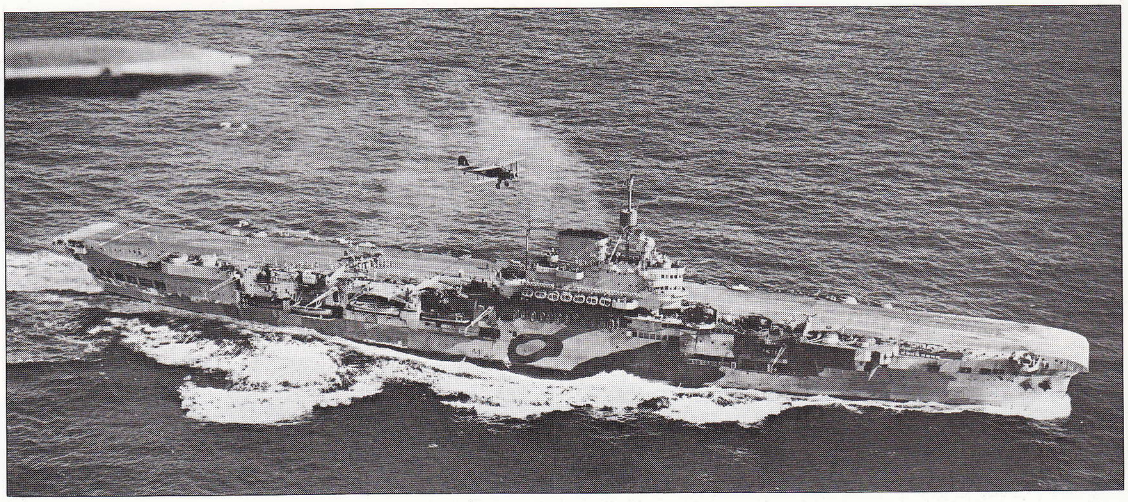
'Illustrious' class
Type: fleet aircraft-carrier
Displacement: 23,000 tons standard and 25,500 tons full load
Dimensions: length 229.7 m (753.5 ft); beam 29.2 m (95.75 ft); draught 7.3 m (24 ft)
Propulsion: 3-shaft geared steam turbines delivering 110,000 shp (82027 kW)
Speed: 31 kts
Armour: belt and hangar wall 114 mm (4.5 in) except *Indomitable* 38 mm (1.5 in); deck 76 mm (3 in)
Armament: eight twin 114-mm (4.5-in) DP, six octuple 2-pdr AA, and eight 20-mm AA guns
Aircraft: about 45 except *Indomitable* about 65
Complement: 1,400 including aircrew



Above: HMS Formidable*, seen here from HMS* Warspite*, fought for most of the war in the Mediterranean. An attack by her aircraft on the Italian fleet on 28 March 1941 damaged the battleship* Vittorio Veneto *and crippled the cruiser* Pola*, which was subsequently sunk.*

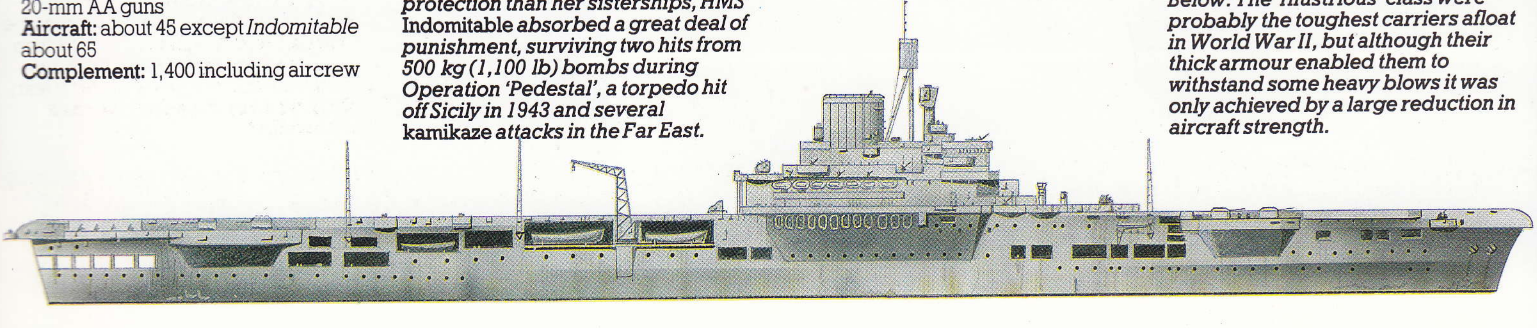


Left: Joining the fleet in August 1940, HMS Illustrious *steamed straight to the Mediterranean, where her airgroup sank two Italian destroyers and raided North Africa.*



Despite having rather lighter protection than her sisterships, HMS Indomitable *absorbed a great deal of punishment, surviving two hits from 500 kg (1,100 lb) bombs during Operation 'Pedestal', a torpedo hit off Sicily in 1943 and several kamikaze attacks in the Far East.*

Below: The 'Illustrious' class were probably the toughest carriers afloat in World War II, but although their thick armour enabled them to withstand some heavy blows it was only achieved by a large reduction in aircraft strength.



UK

'Implacable' class

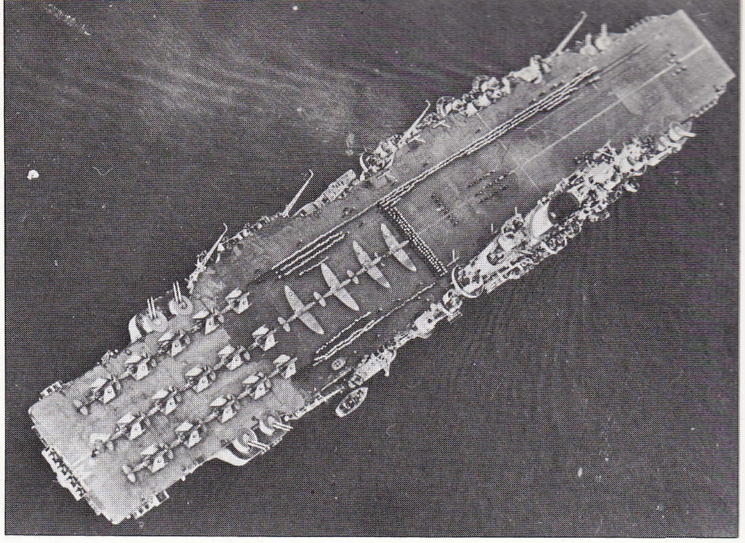
Completed some 30 months after the four 'Illustrious' class ships, the two **'Implacable' class** aircraft-carriers were more closely related to the prototype *Ark Royal*, with the hangar walls slimmed down to only 38 mm (1.5 in). This allowed a better weight distribution for the ships' increased displacement, including the all-important lower hangar. The ships were slightly longer but appeared much bulkier than their half-sisters, their larger hull containing also a fourth set of machinery. This gave them the extra speed that enabled them to pace an American 'Essex' class unit in the Pacific war, although they were considerably smaller in terms of both size and capacity.

Though both were laid down in 1939, HMS ***Implacable*** and HMS ***Indefatigable*** were launched in 1942 and 1944 respectively, but their completion went back because of higher shipyard priorities. When they were most needed, they were still on the stocks, underlining the truth that the navy fights a war largely with what it has available at the beginning. Once finally completed in 1944 they were active for a comparatively short period. In March 1944, while still a new ship, the *Indefatigable* achieved a 'first' in the first-ever deck landing by a twin-engine aircraft, a de Havilland Mosquito. Before heading east to join the rapidly-expanding British Pacific Fleet, she participated in some of the many carrier strikes against the *Tirpitz*, holed-up in Norwegian waters. Though damaging the target sufficiently to keep her almost permanently under repair, the aircraft of the time were the ship's weakest link until they were replaced. Once in the BPF, the ships were engaged in a war already won, in which the British participation was not welcomed in all quarters. Postwar, they were employed mainly in the training role and were scrapped in 1955 and 1956 after hardly a decade of service, being thought not worth the vast expense of a rebuilding along the lines of the *Victorious*.

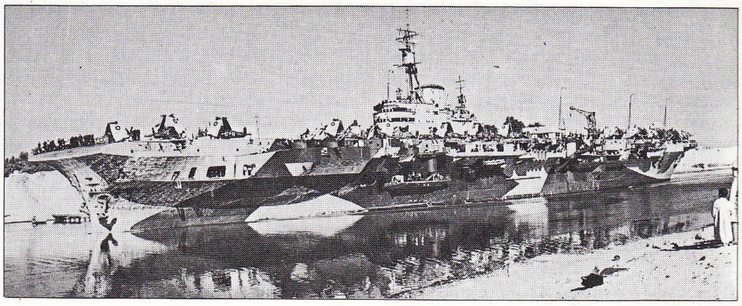
Specification

'Implacable' class

Type: fleet aircraft-carrier
Displacement: 26,000 tons standard and 31,100 tons full load
Dimensions: length 233.4 m (765.75 ft); beam 29.2 m (95.75 ft); draught 7.9 m (26 ft)
Propulsion: 4-shaft geared steam turbines delivering 110,000 shp (82027 kW)
Speed: 32.5 kts
Armour: belt 114 mm (4.5-in); hangar wall 38 mm (1.5 in); deck 76 mm (3 in)
Armament: eight twin 114-mm (4.5-in) DP, six octuple 2-pdr AA and about 38 20-mm AA guns
Aircraft: about 70
Complement: 1,800 including aircrew



HMS Implacable *was faster and carried many more aircraft than the 'Illustrious' class. She is seen (above) returning to Sydney in 1945 and (below) on her way through the Suez Canal to join the Pacific Fleet.*



UK

HMS *Unicorn*

With commendable foresight, considering the quantity of tonnage then being ordered, the 1938 Naval Estimates allowed for the construction of one of a new type of ship, to be employed on the maintenance of the aircraft of a Fleet Air Arm that was obviously due for expansion. She was to be the aviation equivalent of a submarine or destroyer depot ship in providing major forward repair facilities for jobs beyond the capabilities of the average carrier. Though described as an 'aircraft maintenance carrier', it would appear that acting as a carrier was part of her specification, an option taken up due to the wartime shortage of flightdecks. Like the *Ark Royal*, HMS ***Unicorn*** was given two hangars and a flightdeck increased in length by an ungainly overhang aft. She possessed great freeboard with only moderate length, giving an oddly foreshortened aspect.

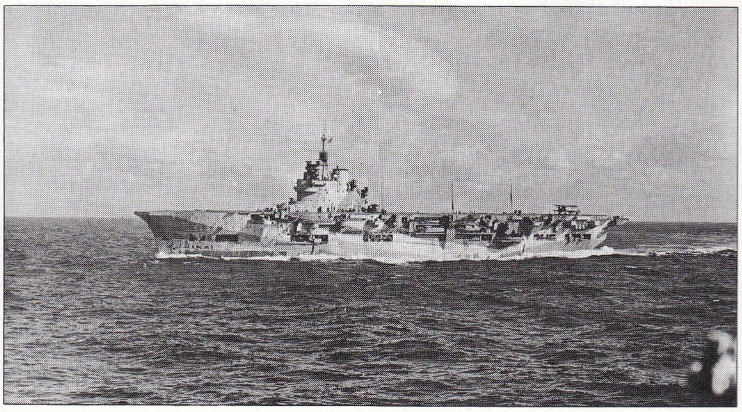
The *Unicorn* was laid down in 1939, launched in 1941 and completed in 1943, in time to join the CVEs of Force V, tasked to provide the fighter cover for both fleet and forces ashore in the first 24 hours following the landings at Salerno. In the event, it was nearly four days before the capture of an airfield ashore could relieve the force of the responsibility, during which time the combination of the CVEs' low speed and small decks while operating in near windless conditions, wrote off over 40 fragile Supermarine Seafire fighters in deck accidents alone. The *Unicorn*'s 6-kt speed advantage and larger deck prevented even more losses.

By early 1944 the *Unicorn* was in the Far East, still doubling as operational carrier pending the delayed arrival of the *Victorious*. Laid up for several years after the war, she was reactivated for the Korean War, finding at last her true vocation at a time when shore air support was almost all carrier-based. The *Unicorn* shuttled with replacement aircraft to and from Singapore, her space frequently being used as short-term trooping accommodation. She was scrapped in 1959.

Specification

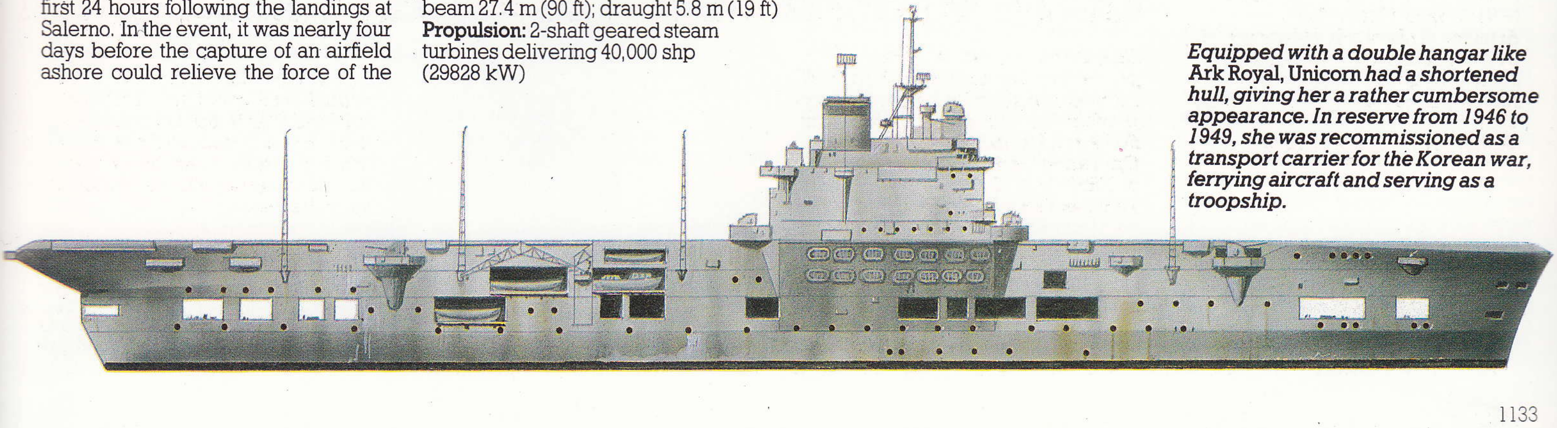
HMS Unicorn

Type: maintenance carrier and secondary light fleet aircraft-carrier
Displacement: 14,750 tons standard
Dimensions: length 195.1 m (640 ft); beam 27.4 m (90 ft); draught 5.8 m (19 ft)
Propulsion: 2-shaft geared steam turbines delivering 40,000 shp (29828 kW)
Speed: 24 kts
Armour: none
Armament: four twin 114-mm (4.5-in) DP, three quadruple 2-pdr AA, and 12 20-mm AA guns
Aircraft: 35 when used as a light fleet carrier
Complement: 1,050



Designed as an 'aircraft maintenance carrier', wartime shortage of carriers led to HMS Unicorn *being pressed into front line service. As part of Force V,* Unicorn *helped provide fighter support for the Salerno landings in 1943 and saw action off Okinawa the next year.*

Equipped with a double hangar like Ark Royal, Unicorn *had a shortened hull, giving her a rather cumbersome appearance. In reserve from 1946 to 1949, she was recommissioned as a transport carrier for the Korean war, ferrying aircraft and serving as a troopship.*



UK

CAM ships

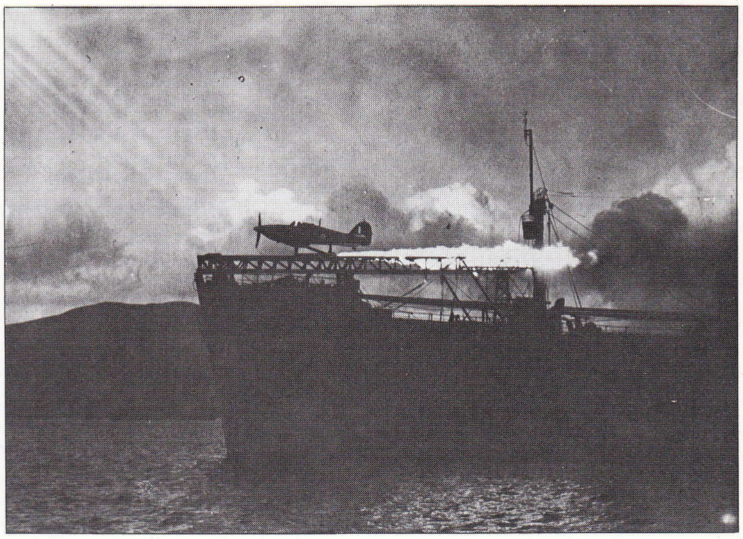
With the European coast from the North Cape to the Spanish border under enemy control by mid-1940, long-range German aircraft began to prove a serious menace to British convoys. The latter, beyond the range of their own air-support and with the escort carrier still in the future, were shadowed relentlessly, the aircraft vectoring in marauding U-boats and, increasingly boldly, attacking stragglers. In 1940, aircraft alone accounted for 192 Allied ships of 580,000 gross registered tons, a total passed in the first four months of 1941. A somewhat desperate measure to counter these pests was the **Catapult-Armed Merchantman** or **CAM ship**, a series of which were converted while the CVEs were building. Initially, three merchantmen and the old seaplane carrier HMS *Pegasus* were each fitted with a catapult upon which was mounted an early Hawker Hurricane or Fairey Fulmar fighter. This group, termed **Fighter Catapult Ships**, proved the idea and a 50-ship programme was initiated, using merchantmen of various sizes. All wore the red ensign, carried cargo and had civilian crews but, spanning the forecastle and No. 1 hatch, was the ungainly catapult structure fixed axially and facing forward. Pilots, drawn from the RAF's Merchant Ship Fighter Unit, would sit for hours, strapped in the cockpit, awaiting the sighting of a 'snooper'. Once launched, they were committed to catching the enemy and returning on a limited amount of fuel. There was no landing-on; if friendly land were close enough (a rare event) the pilot would try to reach it, but, more usually, he had to return to the convoy (often getting shot at) and 'ditch' alongside a likely ship, hoping to be rescued quickly before death arrived from exposure or drowning. It demanded a special sort of bravery.

Once contact was made, the enemy usually fell easily to the high-performance eight-gun fighters. The first recorded kill was by a Hurricane from the FCS *Maplin* early in August 1941, shortly before the CVE HMS *Audacity*'s epic maiden run and, by the end of the year, some six successes had been achieved.

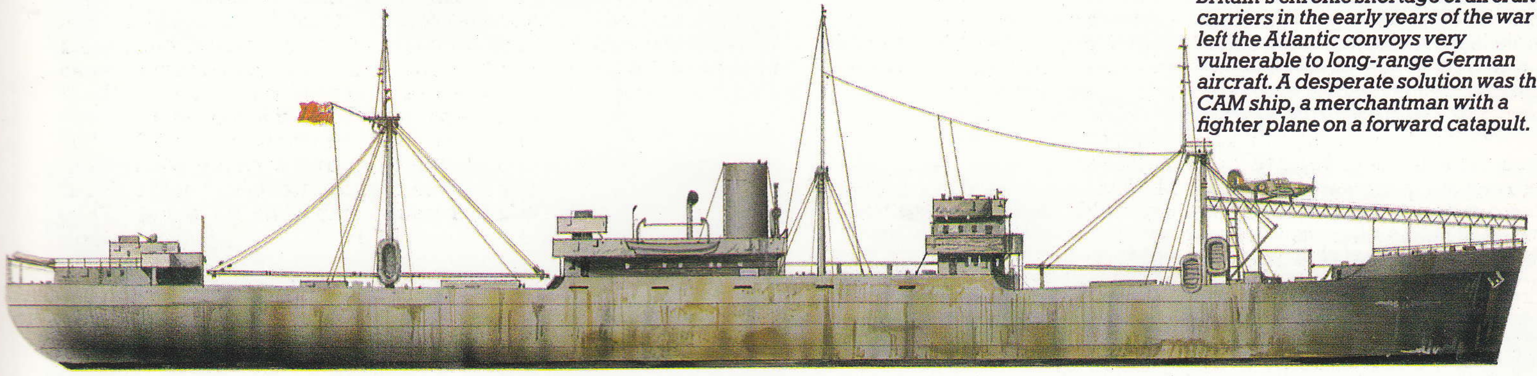
The first CAM ship was the *Empire Rainbow*. The *Empire Lawrence* formed part of the contentious USSR-bound convoy PQ16 in mid-1942. Her aircraft downed one Heinkel He 111 torpedo bomber and damaged another, returning to find her ship sunk. During PQ18, the *Empire Morn*'s Hurricane, during its brief flight, destroyed one aircraft, broke up the attacks of others and succeeded in making Soviet soil.

The CAMs served briefly before being supplemented and then displaced by MACs and CVEs, but their gallant contribution at a desperate time deserves to be fully recognized.

No specification is possible for this widely disparate group of ships.



Once launched from a CAM ship there was no way of landing; after hopefully destroying the intruder, the pilot had to bale out over the convoy knowing that unless he was quickly rescued he would die in the icy water.



Britain's chronic shortage of aircraft carriers in the early years of the war left the Atlantic convoys very vulnerable to long-range German aircraft. A desperate solution was the CAM ship, a merchantman with a fighter plane on a forward catapult.

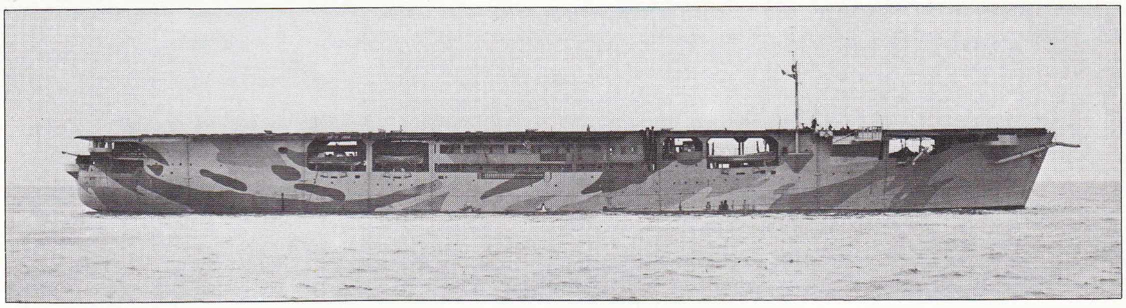
UK

HMS *Audacity*

Though contingency plans existed pre-war to convert merchant ships to auxiliary aircraft carriers, the production of the first such ship seems, in retrospect, to have been leisurely considering the urgency of the situation. The hull selected for conversion was that of the fire-damaged *Hannover*, an almost new Hamburg-Amerika cargo liner seized by the Royal Navy off San Domingo in February 1940. She commissioned as HMS ***Audacity*** in June 1941 with the functions of carrying fighters to curb the menace of the long-range German maritime aircraft and, if possible, Fairey Swordfish to provide a measure of anti-submarine protection. Her facilities were basic, a 140-m (460-ft) flightdeck being laid from the raised forecastle over a lowered bridge structure to a built-up poop. There were just two arrester wires and a barrier; no elevator was fitted because there was no hangar: the six aircraft were stowed and serviced on deck, flight operations involving much manual rearrangement. Because of a shortage of Hawker Sea Hurricanes, she took Grumman F4F-3 Wildcats to sea for the first time in the Royal Navy. Contrasting with the spartan aviation arrangements, *Audacity* retained much of her original accommodation.

September 1941 saw the little carrier's first trip, with the UK-Gibraltar convoy OG41. Heavy attacks from both submarine and aircraft sank six ships but greater losses were prevented by the *Audacity*'s aircraft, which caused several U-boats to dive and lose contact. They also shot down a Focke-Wulf Fw 200C and chased off other intruders.

The *Audacity* returned with the next convoy, HG76, in mid-December 1941. During a four-day nonstop battle the enemy lost five submarines for two merchantmen. With radar direction, the carrier had downed two more snoopers and spoiled the attacks of various U-boats. On 21 December she herself fell victim to three submarine torpedoes but had proved the value of the escort carrier.



The first escort carrier, HMS Audacity's handful of fighters could mean the difference between life or death for a convoy. With convoy OG41 her airgroup destroyed a Focke-Wulf Fw 200C and chased off several U-boats.

Specification

HMS *Audacity*

Type: escort aircraft-carrier

Displacement: 5,540 tons standard

Dimensions: length 144.7 m (474.75 ft); beam 17.1 m (56 ft); draught 8.3 m (27.25 ft)

Propulsion: 2-shaft diesels delivering 4,750 bhp (3542 kW)

Speed: 15 kts

Armour: none

Armament: one 102-mm (4-in) and some smaller guns

Aircraft: six

Complement: not known

Taranto - Operation 'Judgement'

One of the Royal Navy's most audacious and successful operations during World War II, the carrier strike on the Italian fleet had been planned several years previously when Italy's increasing belligerence made war in the Mediterranean a real possibility.

In June 1940 the whole strategic balance of the previously-quiet Mediterranean was upended by the collapse of France and by Italy's entry into the war. The latter had a powerful fleet, well-placed geographically to dominate the central narrows.

The British Mediterranean Fleet, under Admiral Cunningham, was divided between its bases at Gibraltar, Malta and Alexandria, of which the first and last are about 3220 km (2,000 miles) distant. Malta, near the mid-point, was recognized as being a key position, to be defended at all costs, but the Axis powers, apparently not having envisaged a North African war, realized its strategic significance too late.

Like the German fleet, the Italian navy had no aircraft-carriers, its sphere of influence, theoretically, being easily serviced by land-based airpower. Lacking this latter luxury, the British appreciated fully the value of a carrier and one, at least, was usually attached. Before the onset of hostilities in the Mediterranean, the single flightdeck available, HMS *Glorious*, was transferred to the Indian Ocean on a raider hunt and thence to European waters to replace the lost HMS *Courageous*. When the *Glorious*, too, was lost in June 1940, HMS *Eagle* was sent to join Cunningham's flag, reinforced further in the August by arrival of the new HMS *Illustrious*. Between them, these two ships could muster 42 Fairey Swordfish torpedo/search/reconnaissance aircraft (the much-loved 'Stringbag') and 19 fighters comprising Fairey Fulmars and Gloster Sea Gladiators.

The Royal Navy was active from the outset, passing reinforcements particularly from west to east and building up the forces at Malta. While the Italian fleet was often observed at sea it remained fairly passive, but the latent threat that it posed could not be ignored.

The Italian fleet's main base was the southern port of Taranto, only a few hour's dash from Malta. The British, old Mediterranean hands, had long planned an air strike on the port as a war-game, a possibility considered more seriously in 1935 as a step in the graded response to Mussolini's invasion of Abyssinia.

This plan was dusted-off once two carriers were available, and preparations began for a raid on Trafalgar Day, 21 October 1940. To this end the RAF, using Malta-based Martin Marylands, began a regular reconnaissance schedule, but a delay was imposed by a fire in the hangar of the *Illustrious*, which destroyed or damaged several aircraft.

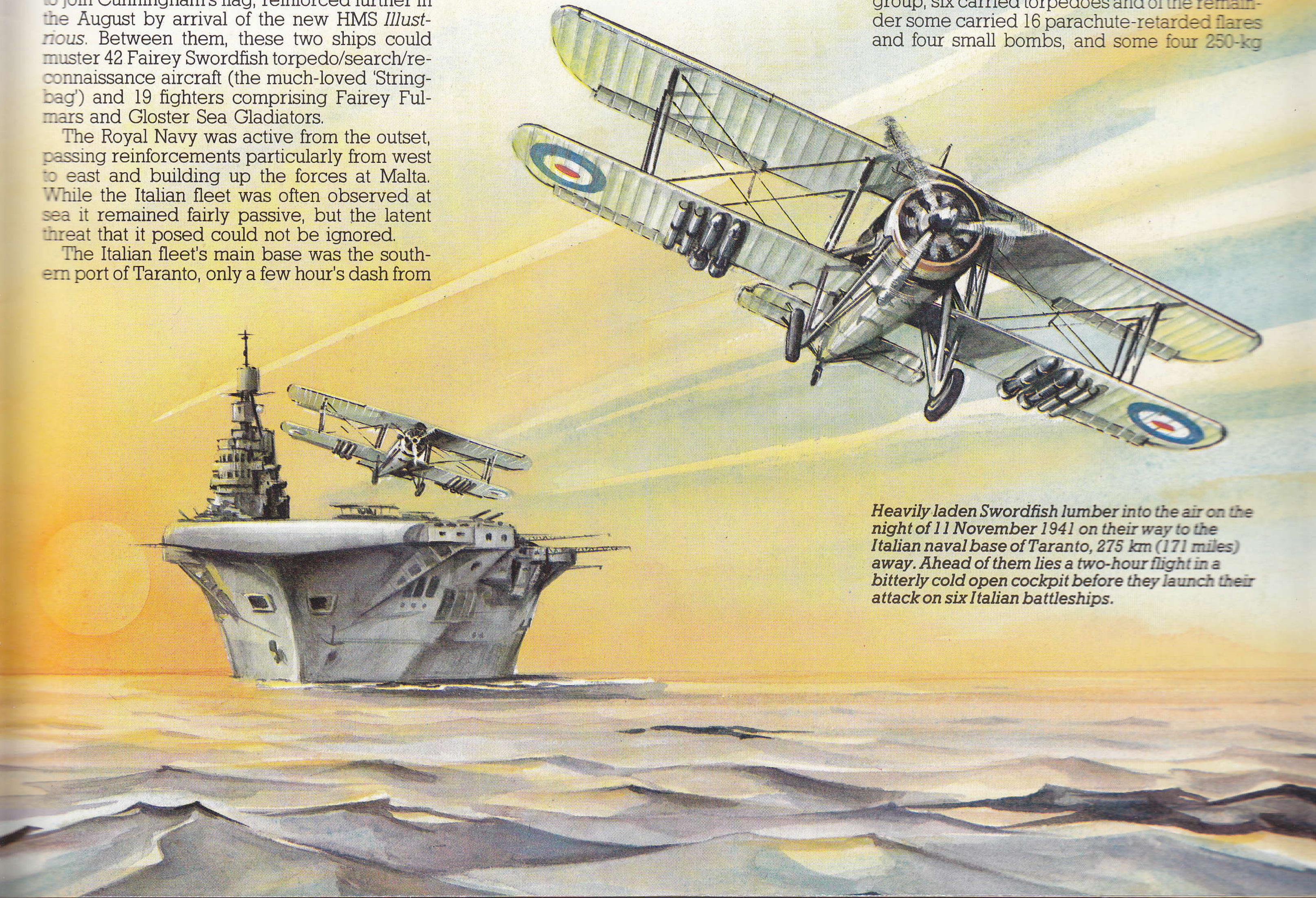
Urgency was then injected by the unexpected Italian invasion of Greece on 28 October, which presented the British with a whole new range of naval commitments. Clearly the east-west route through the Mediterranean had to be kept open, and dealing with Taranto would be a step in the right direction.

It was resolved to hit the base at the next favourable moon-phase, on 11 November, naval activity being disguised in a series of convoy movements, necessary because the enemy anticipated an attack but needed to be kept unaware of its timing. Unfortunately the venerable *Eagle*, which had been heavily shaken-up by bombing following the action off Calabria in the previous July, had to withdraw with a major failure of her aircraft fuelling system. She left *Illustrious* with a legacy of five night-trained Swordfish and crews to make up numbers.

The fleet sailed from Alexandria on 6 November 1940, covering convoys to both Crete and Malta, and the passing-through of naval units. On 8 November the *Illustrious* fighters were kept busy against would-be shadowers and bombers and, on the following day, three of the *Eagle*'s Swordfish had to 'ditch' because of contaminated fuel.

On the morning of the attack, one of the carrier's Fulmars called at Malta for the latest reconnaissance update. It showed that delay had served the British well, for five of the enemy's six battleships were at home, the sixth joining during the day. All were lying in the Mar Grande, the spacious outer harbour which, enclosed by offshore breakwaters, is an elliptical body of water, roughly 6.4 km (4 miles) along its major axis, which lies approximately north west to south east. About the centre of the landward side lies the town of Taranto, with a narrow channel leading to the Mar Piccolo, the inner harbour, in which lay cruisers and destroyers, together with a seaplane base.

Attack would be opposed by the warships' armaments, backed up by an estimated 21 medium-calibre AA gun emplacements and 22 searchlight installations. Fortunately for the British, only about one-third of the enemy's planned length of anti-torpedo nets could be seen to be in position, and his comprehensive balloon barrage had suffered damage in a recent storm. Even so, the reconnaissance pictures showed that, taking into account both nets and balloons, air attack was possible on only narrow fronts, and it was resolved to use small numbers of aircraft for the actual strike, backed by extensive diversionary attacks. Only 21 aircraft were to be involved in the night attack, a first strike of 12 and a second of nine. Of the first group, six carried torpedoes and of the remainder some carried 16 parachute-retarded flares and four small bombs, and some four 250-kg



Heavily laden Swordfish lumber into the air on the night of 11 November 1941 on their way to the Italian naval base of Taranto, 275 km (171 miles) away. Ahead of them lies a two-hour flight in a bitterly cold open cockpit before they launch their attack on six Italian battleships.

(551-lb) bombs. The flares were to silhouette the main targets for the low-flying torpedo-carriers, and the bombs were for diversionary attacks on smaller warships in the Mar Piccolo, the seaplane base and the oil fuel depot.

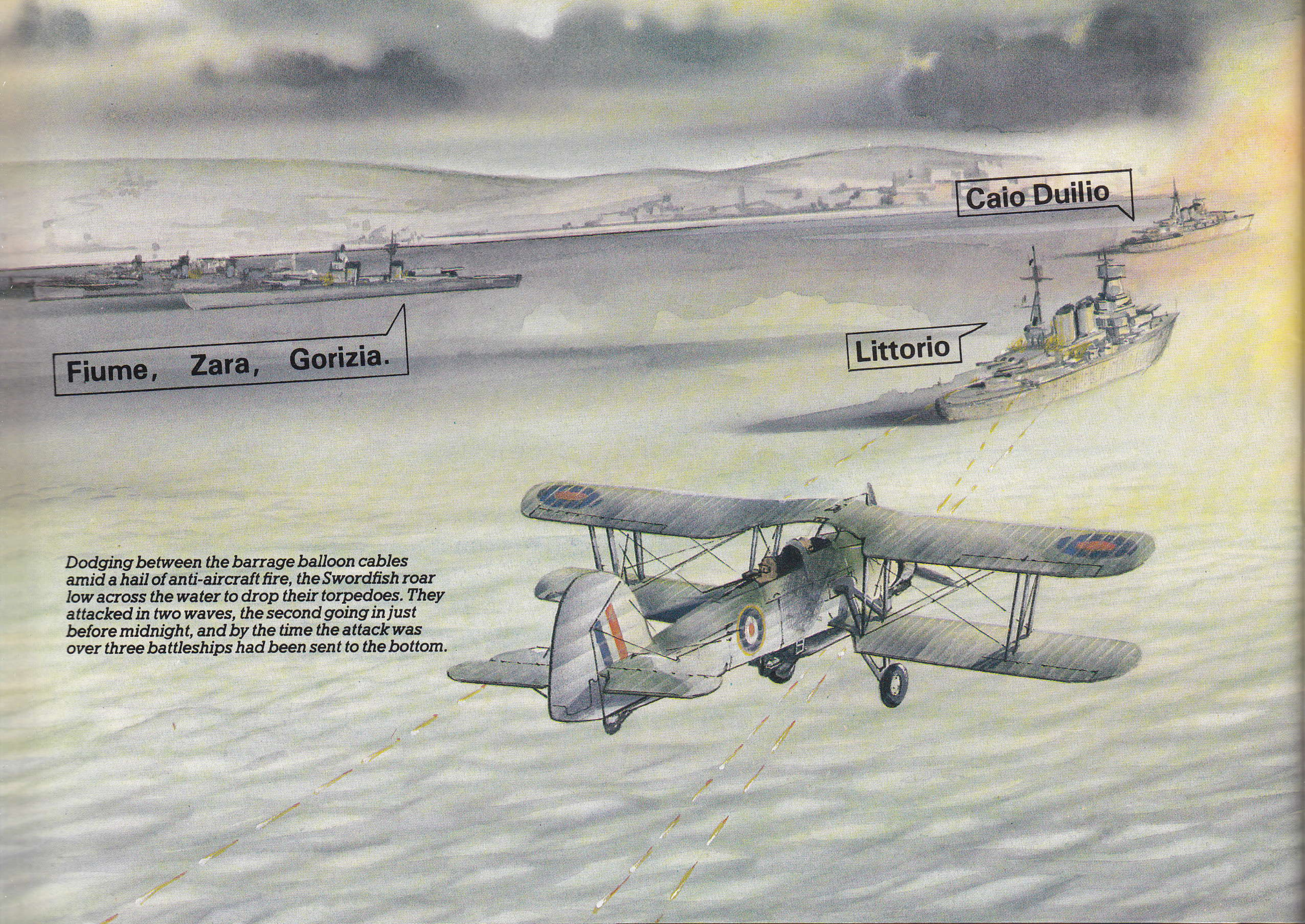
A final air attack on the British on the afternoon of 11 November should have given the Italians cause for concern through the very nature of the task group's composition, but there was no apparent reaction. In dead calm conditions under a three-quarter moon, the first 12 Swordfish lumbered, heavily loaded, into the air. By 20.40 they were all away on the 275-km (170-mile) two-hour flight, their crews freezing in their open cockpits. Long before their arrival the port was marked by a multi-coloured cascade of fire, arcing aimlessly in the clean air, the jittery Italians being warned of aircraft noises by listening apparatus but, fortunately, lacking night-fighters.

At 23.02, the first British flare blossomed at 1370 m (4,500 ft) followed by others in a neat line at 805-m (880-yard) intervals. The torpedo aircraft had gone their own way, splitting further into two groups to attack from the south west and north west. Of these the first had to fly between the invisible balloon cables, and here the stately 85 mph (137 km/h) of a Stringbag was a positive advantage. All crews spoke of the sheer volume of fire thrown up from all sides but, apparently, there was no searchlight support. In the open cockpit of a Swordfish one was very close to the action. Like whirring grey moths the aircraft quartered the anchorage, rumbling in and out at below funnel height, the tracer following in a multitude of flat arcs. Miraculously, only one of the aircraft was lost, while a single hit put the *Cavour* on the bottom and another holed the new *Littorio*'s port quarter. The bombers, meanwhile, had raised a hearty blaze in the seaplane base, which thus served as a beacon to welcome the second strike, about 40 minutes behind the first.

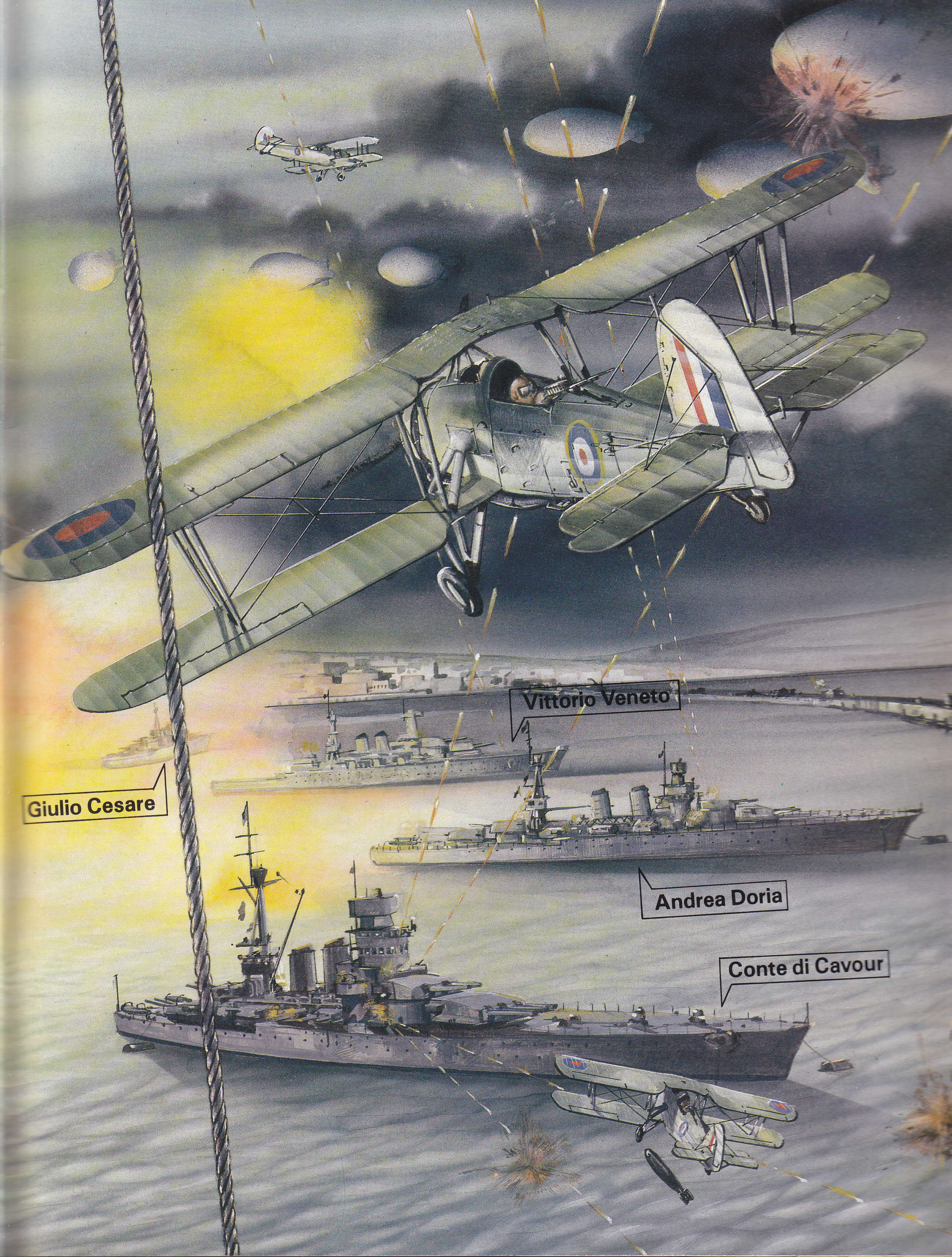
Again the flare-line worked well, throwing the stationary Italian ships into sharp relief. Only five torpedo aircraft were in this group, arriving from the north after a diversionary jink in the course. From a height of barely 6 m (20 ft) the torpedoes went in, one by one, the attackers dodging each other, the targets and the balloons. One crashed and another was hit, but so was the *Duilio* and, again, the *Littorio*. The bombers suffered from faulty fusing and many of their weapons failed to explode, including one that penetrated well into the cruiser *Trento*, but this detracted little from the scale of the success.

In the early hours, close aboard the Greek Island of Cephalonia, the *Illustrious* received her brood as they arrived singly and in pairs, tattered and elated. For the loss of only two aircraft, three enemy battleships had been bottomed, confirmed on the following day by aerial reconnaissance. In deep water they would have been lost; as it was, two were eventually salvaged and returned to service.

The value of the attack lay in its demonstration of the sheer economy of a well-planned carrier strike, the further moral ascendency given to the outnumbered Royal Navy and the withdrawal of all Italian heavy units to points north. Cunningham signalled, on the following day, 'Illustrious manoeuvre well executed', and indeed it was so.



Dodging between the barrage balloon cables amid a hail of anti-aircraft fire, the Swordfish roar low across the water to drop their torpedoes. They attacked in two waves, the second going in just before midnight, and by the time the attack was over three battleships had been sent to the bottom.


Vittorio Veneto
Giulio Cesare
Andrea Doria
Conte di Cavour

UK

MAC ships

Lead orders for escort carriers (CVEs) were placed in early 1942, but urgent measures were required to close the mid-Atlantic gap during their building. One such was the CAM ship, the other the **MAC (Merchant Aircraft Carrier)**, an ingenious solution later copied by the Japanese. The Ministry of War Transport was, understandably, reluctant to release good-class cargo tonnage for conversion to dedicated CVEs, but the MAC retained the greater part of its cargo capacity while having a flight deck topside. Breakbulkers required hatches and cargo-handling gear to function, but grain carriers required only small apertures to their holds, through which the hoses for loading and discharging grain could be inserted. This arrangement was fully compatible with fitting a flightdeck. Like the CAMs, the MACs sailed under the red ensign, only their flight personnel being Royal Navy. Similarly, they were integrated more with the convoy than its escort, though requiring more manoeuvring space. Appropriately carrying Empire 'Mac' names (particularly so as they came from Scottish yards), the first six were all converted from incomplete ships, with 129 by 19 m (423 by 62 ft) flightdecks and a diminutive hangar aft capable of accommodating four Fairey Swordfish aircraft.

From the point of view of cargo requirements and dimensions, tankers were also very suitable candidates for conversion, but the Admiralty had grave doubts of the fire risk. Anglo-Saxon Petroleum (now Shell) resolved the problem on their behalf, resulting in nine of their tankers being converted (though retaining their familiar Shell names) and four more liquid-cargo Empire 'Macs' being launched for the job. The main difference between the wet and dry cargo carriers lay in the lack of a hangar on the tankers, the aircraft remaining topside in all weathers. Despite the urgency of the programme, it was April 1943 before the first MAC entered service. They were exceedingly fortunate ships, all 19 surviving the war to be reconverted.

The dry-cargo 'Empire Mac' class ships were the ***Empire Macalpine, Empire Macandrew, Empire Maccallum, Empire Macdermott, Empire Mackendrick*** and ***Empire Macrae***. The equivalent tanker 'Empire Mac' class comprised the ***Empire Maccabe, Empire Maccoll, Empire Mackay*** and ***Empire Macmahon***. Finally, the units of the 'Shell' class were the ***Acavus, Adula, Alexia, Amastra, Ancylus, Gadila, Macoma, Miralda*** and ***Rapana***.

Specification
'Empire Mac' dry class

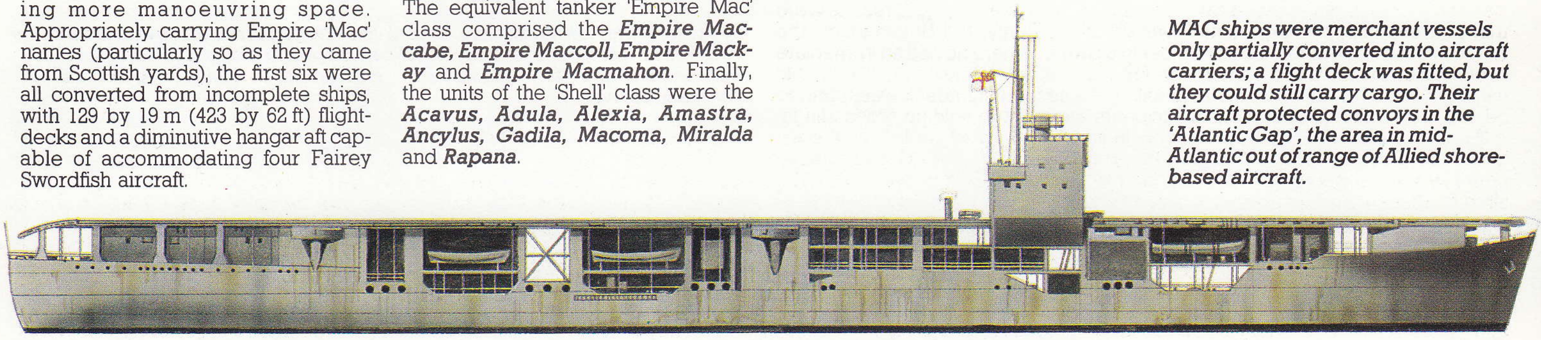
Type: merchant aircraft-carrier
Displacement: 7,930 to 8,250 gross tons
Dimensions: length between 135.6 and 139.9 m (445 and 459 ft); beam between 17.1 and 17.7 m (56 and 58 ft); draught 7.5 m (24.66 ft)
Propulsion: 1-shaft diesel delivering 3,300 bhp (2461 kW)
Speed: 12.5 kts
Armour: none
Armament: one 102-mm (4-in), two 40-mm AA and some smaller guns
Aircraft: four
Complement: 110

Specification
'Empire Mac' tanker class

Type: merchant aircraft-carrier
Displacement: 8,850 to 9,250 gross tons
Dimensions: length 146.7 to 148 m (481.3 to 485.5 ft); beam 18.0 to 18.8 m (59 to 61.66 ft); draught 8.0 to 8.4 m (26.25 to 27.5 ft)
Propulsion: 1-shaft diesel delivering 3,300 bhp (2461 kW)
Speed: 11.5 kts
Armour: none
Armament: one 102-mm (4-in) and some smaller guns
Aircraft: four
Complement: 110

Specification
'Shell' class

Type: merchant aircraft-carrier
Displacement: 8,000 gross tons
Dimensions: length 146.5 to 147 m (480.66 to 482.25 ft); beam 18.0 m (59 ft); draught 8.4 m (27.66 ft)
Propulsion: 1-shaft diesel delivering 3,750 bhp (2796 kW)
Speed: 13 kts
Armour: none
Armament: one 102-mm (4-in) and some smaller guns
Aircraft: four
Complement: 105

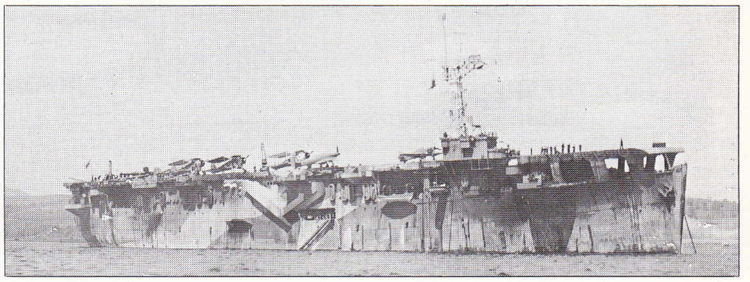


MAC ships were merchant vessels only partially converted into aircraft carriers; a flight deck was fitted, but they could still carry cargo. Their aircraft protected convoys in the 'Atlantic Gap', the area in mid-Atlantic out of range of Allied shore-based aircraft.

UK

British-built escort carriers

Few escort carriers were produced by British yards, which worked on more specialized ships, leaving series production to the Americans. There was, understandably, also reluctance to release good-quality mercantile tonnage for conversion at a time of severe shortage. As a result, only five British-built CVEs saw service, HMS ***Vindex*** and the roughly-similar HMS ***Nairana***, the smaller HMS ***Activity***, the larger HMS ***Campania*** and the ex-passenger liner HMS ***Pretoria Castle***. Unlike their American counterparts, built from similar hulls, they were all different, tending to have longer but narrower flightdecks. In addition the hangar was served by only one elevator, which made for much manhandling of aircraft. They were more solidly built than the American CVEs, with steel-sided hangars and steel flightdecks. On average, they stowed 15 to 18 aircraft, in the approximate ratio of two Fairey Swordfish to one fighter (Hawker Sea Hurricane, Grumman Wildcat or Fairey Fulmar). The *Activity* stowed fewer, and the larger *Pretoria Castle* spent most of her operational career in the training role. The four smaller ships were converted from twin-screw diesel cargo liners of the Blue Funnel and Port Lines, which could be reconverted post-war.



Short of spare merchant tonnage, Britain built few escort carriers, but ships like HMS Vindex***, seen here in 1944, proved very successful working with submarine hunting groups.***

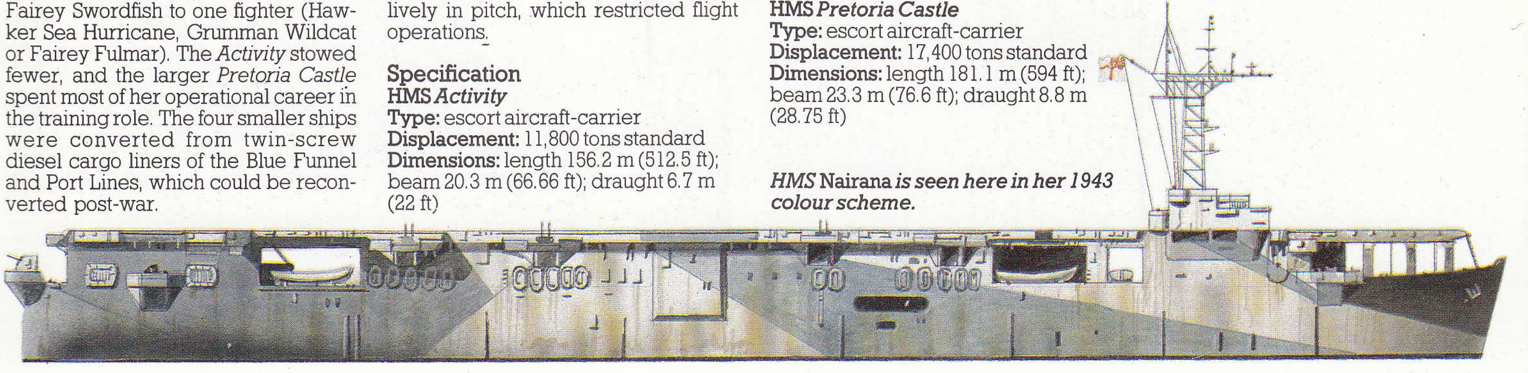
The British CVEs ran extensively with convoys to and from Gibraltar. Working in pairs, they became potent anti-submarine ships. Their Swordfish were equipped with search radar and they themselves with Asdic (sonar), which allowed co-operation with dedicated hunter-killer groups, a luxury possible only after all the convoys were adequately escorted. Later in the war they were used on the Arctic convoy route, the significance of their contribution being recognized by their wearing the flag of the senior naval officer. They were less successful in the severe northern conditions, their lack of length making them extremely lively in pitch, which restricted flight operations.

Specification
HMS *Activity*

Type: escort aircraft-carrier
Displacement: 11,800 tons standard
Dimensions: length 156.2 m (512.5 ft); beam 20.3 m (66.66 ft); draught 6.7 m (22 ft)
Propulsion: 2-shaft diesels delivering 12,000 bhp (8948 kW)
Speed: 18 kts
Armour: none
Armament: two 102-mm (4-in) AA and 10 twin 20-mm AA guns
Aircraft: 15
Complement: 700

Specification
HMS *Pretoria Castle*

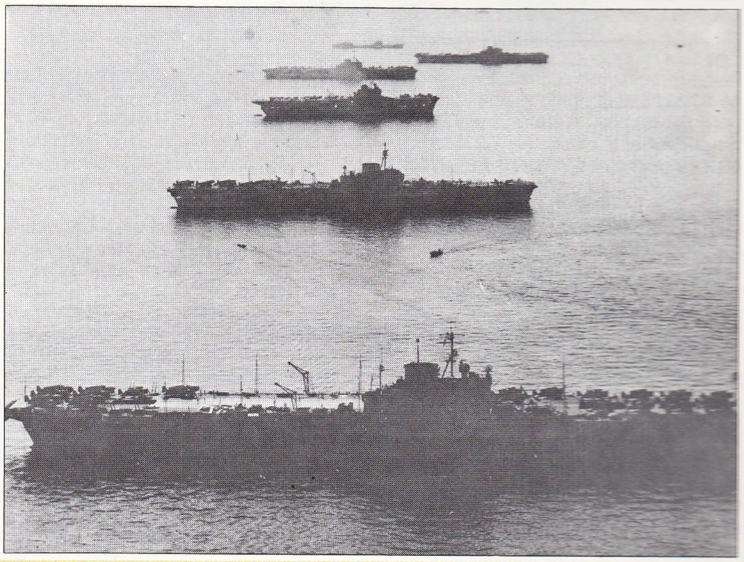
Type: escort aircraft-carrier
Displacement: 17,400 tons standard
Dimensions: length 181.1 m (594 ft); beam 23.3 m (76.6 ft); draught 8.8 m (28.75 ft)
Propulsion: 2-shaft diesels delivering 11,400 bhp (8501 kW)
Speed: 16 kts
Armour: none
Armament: two twin 102-mm (4-in) AA, four quadruple 2-pdr AA, and 10 twin 20-mm AA guns
Aircraft: 15
Complement: not known



HMS Nairana *is seen here in her 1943 colour scheme.*

British Carriers in the Far East

As the naval war in the Mediterranean and Atlantic drew to a close, the Royal Navy was able to concentrate its major carriers in the Far East to form the British Pacific Fleet. The strike on the oil refinery at Sabang, April 1944, was modest by American standards yet involved four times as many aircraft as were used at Taranto.



By the time the Royal Navy had assembled a large carrier force the result of the Pacific war was no longer in doubt. A carrier group of this size operating in European waters a few years earlier could have dramatically affected the course of the war.

By the final year of World War II, when the British Pacific Fleet formally came into existence, the US Navy was using naval airpower on a grand scale with operational doctrines to which the British needed to be re-educated. A first stage had been reached in early 1943, when HMS *Victorious* worked in the Pacific for several months with the USS *Saratoga*. A year on, the Americans reciprocated with the temporary loan of the *Saratoga* to the nucleus of the new British fleet, then based on Ceylon. This included the *Illustrious* and other major units, which could be released to eastern service by virtue of the running-down of the sea war in the Mediterranean.

Following a couple of weeks' intensive work-up, the two carriers formed the cutting edge of a 27-ship task force, known as TF 70, formed to carry out a strike on the major oil refinery at Sabang Island, at the northern tip of Sumatra on 16 April 1944. Though under a British flag officer, it was a multi-national force, wearing six different ensigns. To the British it was a luxury to go on to the offensive against the Japanese, the two carriers fielding 83 aircraft, or over four times the force employed at Taranto. The following month saw a repeat exercise carried out on Surabaya in Java. Though losses were very light, results were thin but, even so, the experience was valuable. Firstly, the British learnt the wisdom of sailing the force commander in a carrier, where he had an immediate overview of the situation, rather than (as was traditional) having him wear his flag in a battleship. Further, the availability of a second flightdeck was found to be vital for sustained operations if accidents were not to hold up proceedings.

By the end of 1944, the quietening Indian ocean could be left to the six available escort carriers of the East Indies Fleet, based on Ceylon, occupied primarily with supporting the 14th Army campaign in Burma with their 150 aircraft, these being relieved finally by the new light fleet carriers.

In January 1945 the British fleet carriers, which had been exercising in twos and threes, primarily against oil-production targets in the East Indies, left to form the nucleus of the new British Pacific Fleet (BPF) based on Sydney. On the way, they mounted the first British four-carrier strikes against the Palembang refineries in south east Sumatra. These were successfully carried out in the face of stiff opposition and provided useful experience in the operation of upwards of 100 aircraft in the simultaneous strike and support roles.

On 15 March 1945, the British Pacific Fleet reported itself fully operational from its temporary base at Manus, in the Admiralty Islands, north of New Guinea. Not the least of its problems had been the assembly and organization of the enormous American-style 'fleet train', necessary for the independent sustenance of the fleet in all respects in a mobile war far removed from established bases. As TF 57, the BPF was commanded by Vice Admiral Rawlings under the overall direction of the American Commander-in-Chief Pacific, Admiral Nimitz, but serving as an element of Admiral Spruance's 5th Fleet. The BPF was centred on four fleet carriers and a couple of modern battleships and was supported also by six CVEs, its main strength equating roughly to a task group within the US task force. Its first involvement was in the taking of Okinawa.

The British were tasked with suppressing the Japanese airfields on the islands between Okinawa and Formosa, the Sakishima Gunto. Attacking by day and withdrawing by night to replenish and renew aircraft, the force was little opposed for the first few days but, on 1 April 1945, the day of the main landings, HMS *Indefatigable* was hit squarely by a *kamikaze*. Thanks to her armoured deck she was out of action only briefly.

After a month's continuous operations the British pulled out for a break, but were soon back as their American CVE stand-ins were unable completely to subdue Japanese aerial activity from the islands. On 4 May HMS *Formidable* was hit by a *kamikaze*, so hard that even the armoured flight deck was punctured. She was out of action for 80 minutes. Another bounced off HMS *Indomitable*. Attrition in aircraft on both sides continued relentlessly day after day. On 9 May the *Formidable* was hit again, and HMS *Victorious* was struck twice. There were few casualties, but aircraft losses aboard were considerable.

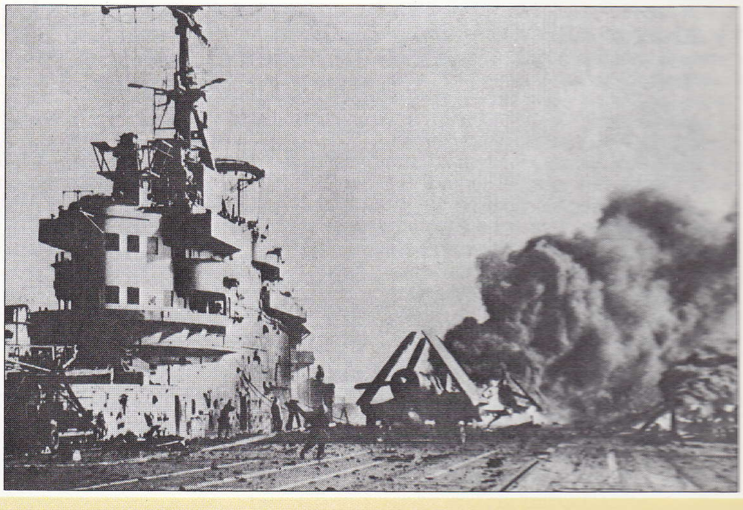
On 25 May, with Okinawa in US hands, TF 57 left the area after two months of concentrated activity. The heavy construction of the British carriers had convinced the Americans of its utility for, though they too had lost no carriers in the campaign, several had been very seriously damaged and forced to withdraw.

Restyled TF 37, the BPF joined Admiral McCain's TF 38, which itself had eight fleet and six light carriers for the final assault against the Japanese homeland. This occupied the last month of the war with continuous activity against a still-lively enemy who, fortunately, had apparently run out of *kamikazes*.

After the de facto Japanese surrender in mid-August, the Allied fleets remained on station off the Japanese coast until the formal signing in early September. They were struck by a typhoon in late August, a couple of the American carriers pitching heavily enough to collapse their overhung forward flightdecks. Again the British design proved superior and the so-called 'hurricane bow', plated right up, was introduced to later US designs.

The BPF effort had extended to nearly 8,000 aircraft sorties with the loss in action of 85 aircraft. Half that number again were lost to *kamikaze* strikes. Their achievements had been considerable and both fleets had benefited from the other's experiences.

HMS **Victorious and Implacable**, *seen from HMS* **Formidable** *on 10 July 1945 as the British Pacific Fleet prepares to launch air strikes against the Japanese mainland. Even when carrying a bigger air group than they were designed for, the British ships carried far fewer aircraft than their American counterparts.*



Time and time again, British carriers were saved by their thick deck armour from destruction by **kamikaze attack**. *Here, aircraft burn on HMS* **Illustrious** *after a suicide bomber has struck. Several American carriers had to be withdrawn for repair but British carriers were quickly back in action.*

UK/USA

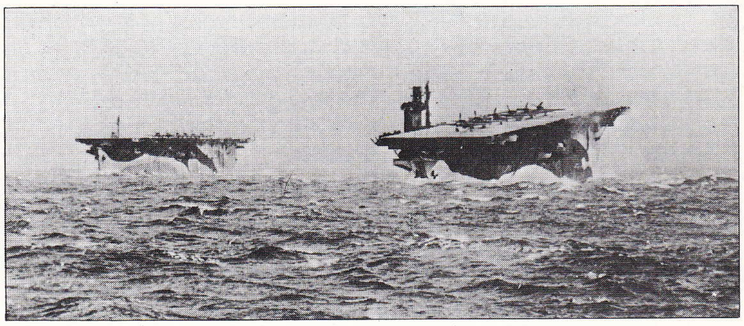
American-built escort carriers

Like the British, the Americans had pre-war ideas on the conversion of mercantile hulls to auxiliary carriers. Early in 1941, two C3 hulls were thus earmarked and the first was rebuilt in only three months, commissioning as the USS *Long Island* (AVG.1) within days of the British *Audacity*. In concept, the American ship was well ahead, having both hangar and elevator, though making poor use of available space. Such early AVGs had a hangar occupying only the after quarter or so of the underdeck space, a similar volume ahead of it being devoted to accommodation (which should have gone below in the original cargo spaces in the hull proper). Below the forward half of the flightdeck the space was open, the overheads being supported on frame structures. What they did have was a catapult (known as an 'accelerator') and the popular bunk beds and cafeteria messing.

The *Long Island*'s first sister was not completed until November 1941, and was transferred to the British as HMS ***Archer*** (BAVG.1), being joined later by three more **'Archer' class** ships. As the programme got into its stride the Royal Navy received eight of the **'Attacker' class** and 26 of the very similar **'Ruler' class**. Both had full-length hangars, the later class having improved stowage factors. Following early experience, the British required higher standards of fuel and fire protection than the Americans, promoting a measure of criticism of 'gold-plating'. Early American ships were diesel-driven, later units having steam plant; both types experienced a fair share of machinery problems.

With limited capacity for flexibility, CVEs tended to be fitted out for roles either in convoy escort or in assault support, their organization and aircraft complement being tailored to suit. Once available in larger numbers they were often integrated directly with AS groups. They often worked in larger groups (five at Salerno and nine for the South of France landings), but some saw no action, being engaged on aircraft ferrying. All that were still fit were converted back to mercantile roles after the war.

The 'Archer' class comprised five ships, namely HMS ***Archer***, HMS ***Avenger***, HMS ***Biter***, HMS ***Charger*** and HMS ***Dasher***, though the *Charger* was retained by the US Navy as CVE.30 for the training of British aircrews in American waters. The 'Attacker' class was larger, and was made up of HMS ***Attacker***, HMS ***Battler***, HMS ***Chaser***, HMS ***Fencer***, HMS ***Pursuer***, HMS ***Stalker***, HMS ***Striker*** and HMS ***Trailer***. Finally there was the 'Ruler' class, which was made up of HMS ***Patroller***, HMS ***Puncher***, HMS ***Ravager***, HMS ***Reaper***, HMS ***Searcher***, HMS ***Slinger***, HMS ***Smiter***, HMS ***Speaker***, HMS ***Tracker***, HMS ***Trouncer***, HMS ***Trumpeter***, HMS ***Ameer***, HMS ***Arbiter***, HMS ***Atheling***, HMS ***Begum***, HMS ***Emperor***, HMS ***Empress***, HMS ***Khedive***, HMS ***Nabob***, HMS ***Premier***, HMS ***Queen***, HMS ***Rajah***, HMS ***Ranee***, HMS ***Ruler***, HMS ***Shah*** and HMS ***Thane***.



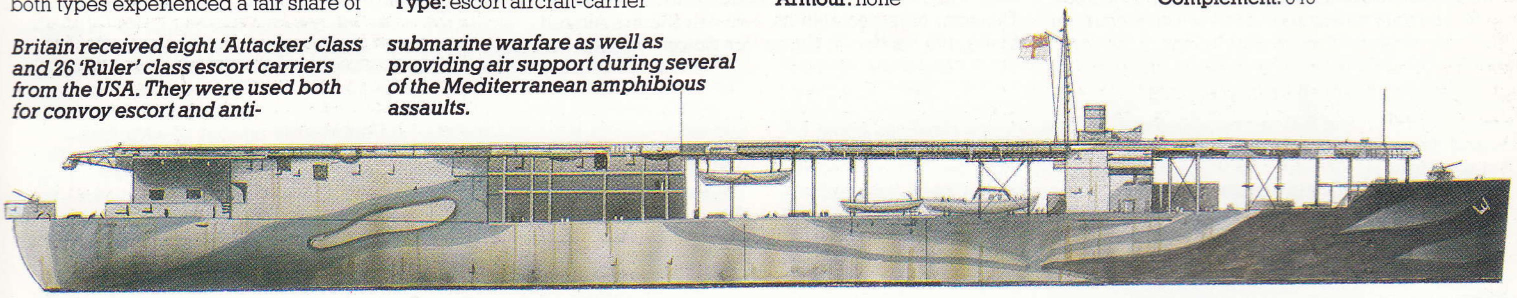
HMS* Avenger *and* Biter*, pictured here in heavy seas, were both 'Archer' class escort carriers.

Specification
'Archer' class
Type: escort aircraft-carrier
Displacement: 8,250 tons standard except *Archer* 9,000 tons standard
Dimensions: length 150.0 m (492.25 ft); beam 20.2 m (66.25 ft); draught 7.1 m (23.25 ft)
Propulsion: 1-shaft diesel delivering 8,500 bhp (6,338 kW) except *Archer* 1-shaft diesel delivering 9,000 bhp (6711 kW)
Speed: 16.5 kts except *Archer* 17 kts
Armour: none
Armament: three 102-mm (4-in) AA, and 15 20-mm AA guns
Aircraft: 15
Complement: 555

Specification
'Attacker' class
Type: escort aircraft-carrier
Displacement: 11,400 tons standard
Dimensions: length 150.0 m (492.25 ft); beam 21.2 m (69.5 ft); draught 7.3 m (24 ft)
Propulsion: 1-shaft geared steam turbine delivering 9,350 shp (6972 kW)
Speed: 17 kts
Armour: none
Armament: two 102-mm (4-in) AA, four twin 40-mm AA, and 15 20-mm AA guns
Aircraft: 18
Complement: 645

Specification
'Ruler' class
Type: escort aircraft-carrier
Displacement: 11,400 tons standard
Dimensions: length 150.0 m (492.25 ft); beam 21.2 m (69.5 ft); draught 7.7 m (25.25 ft)
Propulsion: 1-shaft geared steam turbine delivering 9,350 shp (6972 kW)
Speed: 17 kts
Armour: none
Armament: two 102-mm (4-in) AA, eight twin 40-mm AA, and 20 20-mm AA guns
Aircraft: 22
Complement: 645

Britain received eight 'Attacker' class and 26 'Ruler' class escort carriers from the USA. They were used both for convoy escort and anti-submarine warfare as well as providing air support during several of the Mediterranean amphibious assaults.



UK

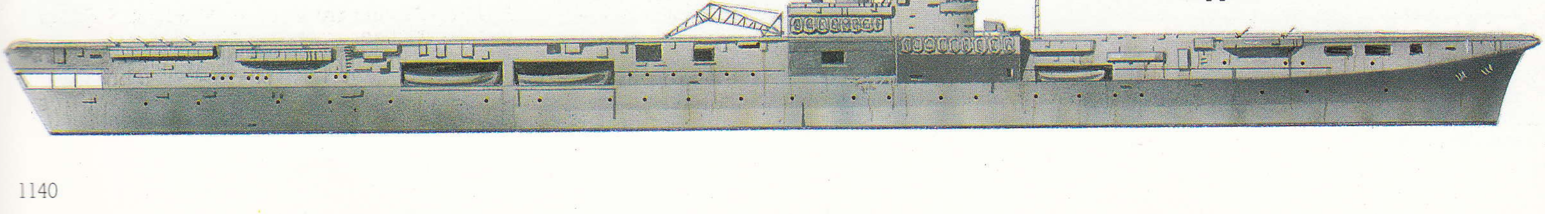
HMS *Perseus* and HMS *Pioneer*

Far Eastern operations had to be conducted far from established bases and maintenance facilities. High attrition rates in aircraft would demand 'repair by replacement' to keep the front-line carriers fully operational, CVEs being used extensively in the exchange process. Lightly damaged aircraft or routine maintenance tasks could be carried out on the fleet carrier herself but lack of space and time demanded that anything more complex be shipped out for repair and, by the very nature of things, the repair facilities had to be afloat. With the only specialist maintenance carrier *Unicorn* used permanently in an operational role, two of the new light fleet carriers of the 'Colossus' class were earmarked as replacements. Though lacking the extra hangar, they were marginally faster but looked 'unfinished' with few of the deck-edge fixtures sported by the operational carriers.

Both HMS ***Perseus*** and HMS **Pioneer** were completed by the end of the war, but only the *Pioneer* succeeded in getting to an operational theatre, with the 11th ACS, arriving in the Far East just in time for the Japanese surrender. Paradoxically, earlier in the war when they could have been of use, they would (like the *Unicorn*) almost certainly have been pressed into an operational role, leaving CVEs to be used as auxiliaries, while in peace too few active flightdecks were maintained to warrant their existence. With little post-war application, the *Pioneer* was scrapped as early as 1954 (earlier intentions of conversions to passenger liners were not pursued due probably to a combination of cost and a diminishing demand for these ships by a public acquiring a taste for air travel). The *Perseus* was nearly recommissioned for the Suez affair of 1956, but then scrapped in 1958.

Specification
HMS *Perseus* and HMS *Pioneer*
Type: maintenance aircraft-carrier
Displacement: 13,300 tons standard
Dimensions: length 211.8 m (695 ft); beam 24.4 m (80 ft); draught 5.6 m (18.4 ft)
Propulsion: 2-shaft geared steam turbines delivering 42,000 shp (31319 kW)
Speed: 25 kts
Armour: minimal
Armament: three quadruple 2-pdr AA and 10 20-mm AA guns
Aircraft: none
Complement: not known

HMS* Perseus *and* Pioneer *were 'Colossus' class carriers, completed as maintenance ships unable to operate in a combat role. Too late to serve in the wartime fleet, they were among the first British carriers to be scrapped.



US Marine Corps

Organization

Since World War II, the US Marine Corps has traditionally been organized into three ground combat divisions: one on the east coast of the United States, one on the west, and one headquartered on Okinawa. Each division has its own aircraft wing.

The 2nd Marine Division is based at Camp Lejeune, North Carolina (supported by the 2nd Marine Aircraft Wing at MCAS Cherry Point, North Carolina), and acts as the nucleus of the Fleet Marine Force Atlantic (FMFLant), providing the manpower to support naval operations with the 2nd Fleet in the Atlantic and the 6th Fleet in the Mediterranean.

The 1st Marine Division is located at Camp Pendleton, California (supported by the 3rd Marine Aircraft Wing at MCAS El Toro, California), and operates primarily as a component of the Rapid Deployment Joint Task Force (RDJTF), providing a combat force ready to be sent into action in any climate and in any location, at only a moment's notice.

The 3rd Marine Division is on Okinawa (supported by the 1st Marine Aircraft Wing at MCAS Futema, Okinawa), and forms the nucleus of the Fleet Marine Force Pacific (FMFPac), providing troops in support of the US Navy's 7th Fleet in the east Asian and western Pacific region.

Each division is broken into battalions (nine infantry, one reconnaissance, one armour, one of combat engineers and one for specialized amphibious operations) and has an artillery regiment with towed guns. The aircraft wings supporting these divisions each have up to eight squadrons of tactical jet aircraft, seven helicopter squadrons, and three transport/observation squadrons. Additionally, the US Marine Corps has two independent brigades, one in Hawaii intended for Pacific operations and one at Camp Pendleton as a further component of the RDJTF.

Marines in their amphibious personnel carriers, LVTP-7s. Assisted by a formidable array of aircraft and sustained in action by a fleet of support ships, the Marines' primary mission remains assault from the sea. Renowned for their toughness and professionalism, they are ready for combat anywhere in the world.

Mention must also be made of the 4th Marine Division, together with its own 4th Marine Aircraft Wing, the former at Camp Pendleton, the latter at NAS Glenview, Illinois. This division is the US Marine Corps Reserve, kept in being by irregular call-up of reservists who train at locations close to their homes. In wartime or in emergency, the President can call the Reserves to active duty.

Among bases where US Marines make their homes is the beleaguered US Navy base at Guantanamo Bay in Cuba, where a reinforced US Marine company some 420 strong is used for security purposes. In the Pacific region, some US Marines are stationed at Subic Bay in the Philippines and at Yokosuka in Japan. In the Mediterranean, another key base is at Naples.

Operationally, the US Marine Corps can be organized into any of three types of formation. The largest is the Marine Amphibious Force (MAF) formed from an entire division plus an aircraft wing. Next in size is the Marine Amphibious Brigade (MAB) one of which, as noted, is kept in being for the RDJTF. The more usual formation is the Marine Amphibious Unit (MAU), based on a composite US Marine battalion and from five to seven US Navy assault ships. Each composite battalion has its own armour, artillery and helicopters. Normally, one MAU is in being at any time in the Mediterranean with another in the Pacific. A variation of the MAU is the Marine Landing Team (MAT), which is a MAU minus the helicopter component. Normally one of these is kept in being in the Pacific region and from time to time another is formed for deployment in the Atlantic. It must be stressed that US Marine forces are formed and deployed as required, so the 'order of battle' outlines are subject to change at any time.

An LVTP-7 swims ashore from USS Saipan. *A ship of this class can deploy and support a Marine Amphibious Unit of 1,900 men. On the right is a 'Newport' class LST, the largest vessel capable of beaching. LVTP-7s spearhead the assault, carrying 25 Marines towards the beach.*

Armed Forces of the World

Marines come ashore from an LCU. Deployed to separate the warring factions in Lebanon, they suffered heavy casualties at the hands of Muslim fanatics. Their mere presence failed to subdue the militias, and political considerations ruled out anything more than token military action.

Current troop strength of the US Marine Corps is 198,574, of whom 162,881 serve in the continental USA, including those committed to the RDJTF; 3,467 US Marines are in Europe and 28,858 in East Asia, mostly on Okinawa.

The US Marines have a reputation for tough discipline and hard training. It begins during 'boot camp' at Parris Island, South Carolina, or San Diego, California, where the drill instructor (DI) reigns almost god-like over recruits who have volunteered from civilian life.

Not even the toughest US Marine wants to return to the era of mindlessly stern discipline exemplified by the night march at Parris Island in April 1956 when, because of an error by DI Staff Sergeant Matthew C. McKeon, six men drowned fording a swamp. But the 12-week basic training course, much of it conducted under starkly realistic conditions, is intended to breed an elite fighter. In the US Marine Corps, unlike the other US services, every member is first and foremost a rifleman. No matter what his military occupation specialty (MOS), each US Marine is expected to be ready to be hurled into a pointblank fire fight.

Once through boot camp, the typical private first class (salary $109.20 per month) can be assigned to any one of nearly 500 training schools. These vary from Air Command/Control Electronics (six weeks at Tustin, California) to Journeyman Plumbing and Water Supply Specialist (11 weeks at Camp Lejeune, North Carolina) to Manual Morse Intercept Electronic Warfare Operator (20 weeks at NAS Pensacola, Florida). But whether plumber or missile technician, every US Marine must meet demanding standards of physical fitness and be prepared to fight on the front line.

US Marine officers come from the 57 colleges and universities which offer Naval Reserve Officer Training Corps (NROTC) programmes, or from officer training programmes within the US Marine Corps itself. The elite regular officer is a graduate of one of the service academies and most come from the United States Naval Academy, the hallowed institution on the Severn River in Annapolis, Maryland, which boasts the world's largest dining room, offers four years of scholarly and military education, turns out good football teams, and produces the future leaders of the US Navy and US Marine Corps. Annapolis sent hundreds of fresh second lieutenants to command platoons in combat in Vietnam, men like Peter A. Messenies, who won the Medal of Honor for taking out a gun position at An Hoa, and James Webb, much-decorated author of the novels *Fields of Fire* and *A Sense of Honor*.

Trucks are unloaded over the bow ramp of a 'Newport' class LST. There are 20 ships in this class, each with a complement of 225 officers and men. They are designed to transport 520 troops and 500 tons of vehicles or cargo at speeds of 20 knots.

Like the other services, the US Marine Corps has made increased use of women since the armed forces became all volunteer in 1975. As of 31 December 1982, the US Marine Corps had 591 woman officers (3.1 per cent of its total) and 8,039 enlisted women (4.5 per cent). An 'all-women' crew operates a McDonnell Douglas C-9B Skytrain jet transport assigned to NAS Memphis, Tennessee. Actual combat is legally ruled out for female US Marines, but the ruling might be unenforceable in a sudden crisis, since men and women serve cheek-by-jowl in nearly all units.

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